RADIO TEST REPORT

Test Report No. : 13024969S-AC-R3

Applicant	:	**Canon Inc**
Type of EUT	:	**Wireless LAN/Bluetooth Combo Module**
Model Number of EUT	:	**ES204**
FCC ID	:	**AZD241**
Test regulation	:	**FCC Part 15 Subpart C: 2019** ***Wireless LAN & Bluetooth Low Energy part**
Test Result	:	**Complied (Refer to SECTION 3.2)**

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3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
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6. This test report covers Radio technical requirements.
   It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 13024969S-AC-R2. 13024969S-AC-R2 is replaced with this report.

Date of test: October 23, 2019 to January 16, 2020

Representative test engineer:
Takahiro Kawakami
Engineer
Consumer Technology Division

Approved by:
Toyokazu Imamura
Leader
Consumer Technology Division

CERTIFICATE 1266.03

☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

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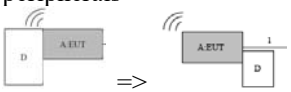
REVISION HISTORY

Original Test Report No.: 13024969S-AC

Revision	Test report No.	Date	Page revised	Contents
- (Original)	13024969S-AC	March 9, 2020	-	-
1	13024969S-AC-R1	March 30, 2020	P.12	Addition of Support equipment: No. D Grand Plate
			P.15	Modification of the Test Distance from 3.965 m to 3.93 m
				Modification of the "r" value from 0.035 m to 0.07 m
2	13024969S-AC-R2	April 2, 2020	P.12	Modification of Configuration and peripherals 
			P.16	Addition of "* Taking in consideration of antenna characteristics, the setup that does not affect spurious emissions was used."
3	13024969S-AC-R3	April 6, 2020	P.12	Addition of "* Taking in consideration of antenna characteristics, the setup that does not affect spurious emissions was used."
			P.16	Deletion of "* Taking in consideration of antenna characteristics, the setup that does not affect spurious emissions was used."

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Reference: Abbreviations (Including words undescribed in this report)

A2LA	The American Association for Laboratory Accreditation
AC	Alternating Current
AFH	Adaptive Frequency Hopping
AM	Amplitude Modulation
Amp, AMP	Amplifier
ANSI	American National Standards Institute
Ant, ANT	Antenna
AP	Access Point
ASK	Amplitude Shift Keying
Atten., ATT	Attenuator
AV	Average
BPSK	Binary Phase-Shift Keying
BR	Bluetooth Basic Rate
BT	Bluetooth
BT LE	Bluetooth Low Energy
BW	BandWidth
Cal Int	Calibration Interval
CCK	Complementary Code Keying
Ch., CH	Channel
CISPR	Comite International Special des Perturbations Radioelectriques
CW	Continuous Wave
DBPSK	Differential BPSK
DC	Direct Current
D-factor	Distance factor
DFS	Dynamic Frequency Selection
DQPSK	Differential QPSK
DSSS	Direct Sequence Spread Spectrum
EDR	Enhanced Data Rate
EIRP, e.i.r.p.	Equivalent Isotropically Radiated Power
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
EN	European Norm
ERP, e.r.p.	Effective Radiated Power
EU	European Union
EUT	Equipment Under Test
Fac.	Factor
FCC	Federal Communications Commission
FHSS	Frequency Hopping Spread Spectrum
FM	Frequency Modulation
Freq.	Frequency
FSK	Frequency Shift Keying
GFSK	Gaussian Frequency-Shift Keying
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
Hori.	Horizontal
ICES	Interference-Causing Equipment Standard
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IF	Intermediate Frequency
ILAC	International Laboratory Accreditation Conference
ISED	Innovation, Science and Economic Development Canada
ISO	International Organization for Standardization
JAB	Japan Accreditation Board
LAN	Local Area Network
LIMS	Laboratory Information Management System
MCS	Modulation and Coding Scheme
MRA	Mutual Recognition Arrangement
N/A	Not Applicable
NIST	National Institute of Standards and Technology
NS	No signal detect.
NSA	Normalized Site Attenuation
NVLAP	National Voluntary Laboratory Accreditation Program
OBW	Occupied Band Width
OFDM	Orthogonal Frequency Division Multiplexing
P/M	Power meter
PCB	Printed Circuit Board
PER	Packet Error Rate
PHY	Physical Layer
PK	Peak
PN	Pseudo random Noise
PRBS	Pseudo-Random Bit Sequence
PSD	Power Spectral Density
QAM	Quadrature Amplitude Modulation
QP	Quasi-Peak
QPSK	Quadri-Phase Shift Keying
RBW	Resolution Band Width
RDS	Radio Data System
RE	Radio Equipment
RF	Radio Frequency
RMS	Root Mean Square
RSS	Radio Standards Specifications
Rx	Receiving
SA, S/A	Spectrum Analyzer
SG	Signal Generator
SVSWR	Site-Voltage Standing Wave Ratio
TR	Test Receiver
Tx	Transmitting
VBW	Video BandWidth
Vert.	Vertical
WLAN	Wireless LAN

CONTENTS **PAGE**

SECTION 1: Customer information

Company Name	:	Canon Inc
Address	:	30-2, Shimomaruko 3-chome, Ohta-ku, Tokyo 146-8501 Japan
Telephone Number	:	+81-3-5482-7283
Contact Person	:	Tomohiro Suzuki

The information provided from the customer is as follows;
- Applicant, Type of Equipment, Model No., FCC ID on the cover and other relevant pages
- Operating/Test Mode(s) (Mode(s)) on all the relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. during testing

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	Wireless LAN/Bluetooth Combo Module
Model No.	:	ES204
Serial No.	:	Refer to SECTION 4.2
Rating	:	DC 3.3 V
Receipt Date of Sample (Information from test lab.)	:	August 28, 2019
Country of Mass-production	:	Japan
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab.

2.2 Product Description

Model: ES204 (referred to as the EUT in this report) is a Wireless LAN/Bluetooth Combo Module.

Radio Specification

Wireless LAN/Bluetooth Combo Module : ES204
Radio Type : Transceiver
Clock frequency (Maximum) : 38.4 MHz

	Bluetooth (BDR/EDR)	**Bluetooth (Low energy)**
Frequency of operation	2402 MHz - 2480 MHz	2402 MHz - 2480 MHz
Channel spacing	1 MHz	2 MHz
Modulation	FHSS: GFSK (*. EDR: GFSK+ /4-DQPSK, GFSK+ 8DPSK)	

	IEEE802.11b	**IEEE802.11g**	**IEEE802.11n (20 MHz band)**	**IEEE802.11n (40 MHz band)**
Frequency of operation	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz	2412 MHz - 2462 MHz 5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz	2422 MHz - 2452 MHz 5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5670 MHz 5755 MHz - 5795 MHz
Channel spacing	5 MHz		2.4 GHz band 5 MHz 5 GHz band 20 MHz	2.4 GHz band 5 MHz 5 GHz band 40 MHz
Modulation	DSSS: DBPSK, DQPSK, CCK	OFDM: BPSK, QPSK, 16QAM, 64QAM		
	IEEE802.11a	**IEEE802.11ac (20 MHz band)**	**IEEE802.11ac (40 MHz band)**	**IEEE802.11ac (80 MHz band)**
Frequency of operation	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz	5180 MHz - 5240 MHz 5260 MHz - 5320 MHz 5500 MHz - 5700 MHz 5745 MHz - 5825 MHz	5190 MHz - 5230 MHz 5270 MHz - 5310 MHz 5510 MHz - 5670 MHz 5755 MHz - 5795 MHz	5210 MHz 5290 MHz 5530 MHz - 5610 MHz 5775 MHz
Channel spacing	20 MHz		40 MHz	80 MHz
Modulation	OFDM: BPSK, QPSK, 16QAM, 64QAM, 256QAM (*256QAM is only for IEEE802.11ac 80 MHz band)			

Antenna type / connector type	Printed on the PCB.
Antenna gain	2.98 dBi (2.4 GHz band) / 4.94 dBi (5 GHz band) *including cable loss of 0.01m length. 1.75 dBi (2.4 GHz band) / 2.27 dBi (5 GHz band) *including cable loss of 0.2 m length.

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on July 19, 2019 and effective August 19, 2019 except 15.258
The revision does not affect the test specification applied to the EUT.

Title : FCC 47 CFR Part 15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz

3.2 Procedures and results

Item	Test Procedure	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	28.2 dB, 0.50012 MHz, L1, QP Mode: TX, 11g, 2412 MHz	Complied a)	-
	ISED: RSS-Gen 8.8	**ISED:** RSS-Gen 8.8			
6dB Bandwidth	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(a)(2)	See data.	Complied b)	Conducted
	ISED: -	**ISED:** RSS-247 5.2(a)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(b)(3)		Complied c)	Conducted
	ISED: RSS-Gen 6.12	**ISED:** RSS-247 5.4(d)			
Power Density	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section 15.247(e)		Complied d)	Conducted
	ISED: -	**ISED:** RSS-247 5.2(b)			
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 15.247 Meas Guidance v05r02	**FCC:** Section15.247(d)	0.5 dB 2378.505 MHz, AV, Hori. Mode: Tx BT LE 2 Mbps 2402 MHz with 11ac-40 Tx 5190 MHz	Complied# e), f)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
	ISED: RSS-Gen 6.13	**ISED:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05r02 8.5 and 8.6.

a) Refer to APPENDIX 1 (data of Conducted Emission)
b) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)
c) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
d) Refer to APPENDIX 1 (data of Power Density)
e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
f) Refer to APPENDIX 1 (data of Radiated Spurious Emission)

Symbols:
Complied The data of this test item has enough margin, more than the measurement uncertainty.
Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

FCC Part 15.31 (e)
The RF Module has its own regulator. The RF Module is constantly provided voltage through the regulator regardless of input voltage. Therefore, this EUT complies with the requirement.

FCC Part 15.203/212 Antenna requirement
It is impossible for end users to replace the antenna, because the antenna is mounted inside of the host device. Therefore, the equipment complies with the antenna requirement of Section 15.203.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	RSS-Gen 6.7	**ISED:** -	N/A	- a)	Conducted
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422 *1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 15.247 Meas Guidance v05 8.5 and 8.6. a) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)					
Symbols: Complied The data of this test item has enough margin, more than the measurement uncertainty. Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.					

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

There is no applicable rule of uncertainty in this applied standard. Therefore, the results are derived depending on whether or not laboratory uncertainty is applied.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor *k*=2.

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)			
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4,5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.6 dB	2.6 dB	2.5 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.0 dB	3.0 dB	3.0 dB	-
	30 MHz-200 MHz	4.6 dB	4.6 dB	4.6 dB	-
	200 MHz-1 GHz	6.0 dB	6.0 dB	6.0 dB	-
	1 GHz-6 GHz	4.9 dB	4.9 dB	4.9 dB	-
	6 GHz-18 GHz	5.5 dB	5.5 dB	5.5 dB	-
	18 GHz-40 GHz	5.4 dB	5.4 dB	5.4 dB	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.8 dB	5.8 dB	5.8 dB	-
	18 GHz-40 GHz	5.7 dB	5.7 dB	5.7 dB	-

SAC=Semi-Anechoic Chamber

SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.98 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	1.75 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.89 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	1.12 dB
Power Measurement above 1 GHz (Average Detector)_SPM-13	1.06 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-13	1.24 dB
Spurious emission (Conducted) below 1GHz	0.9 dB
Spurious emission (Conducted) 1 GHz-3 GHz	0.9 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.9 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.6 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.0 dB
Bandwidth Measurement	0.07 %
Duty cycle and Time Measurement	0.262 %
Temperature	0.95 deg.C.
Voltage	0.83 %

3.5 Test Location

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Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
A2LA Certificate Number: 1266.03 (FCC Test Firm Registration Number: 626366, ISED Lab Company Number: 2973D)

Test site	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

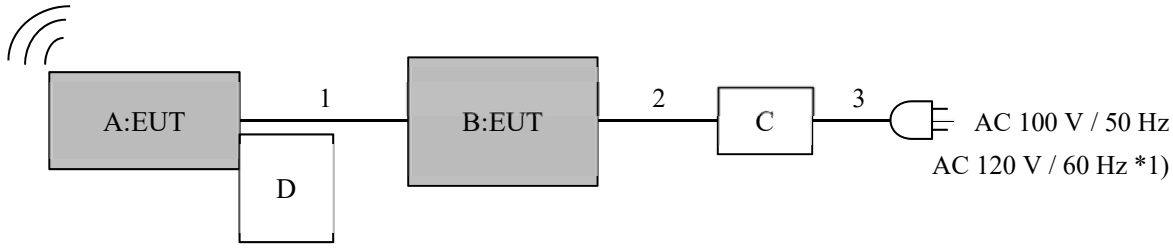
Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - " of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11b (11b)	1 Mbps, PN9
IEEE 802.11g (11g)	54 Mbps, PN9
IEEE 802.11n 20 MHz BW (11n-20)	MCS 4, PN9
IEEE 802.11n 40 MHz BW (11n-40)	MCS 3, PN9
Bluetooth (BT) Low Energy (LE) Uncoded (1M-PHY)	Maximum Packet Size, PRBS9
Bluetooth (BT) Low Energy (LE) Uncoded (2M-PHY)	Maximum Packet Size, PRBS9
*Transmitting duty was 100 % on all tests. *The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: 11b/11g : 10 dBm, 11n-20/11n-40 : 9 dBm BT LE : 5 dBm Software: Tera Term Version 4.9.8 (Date:2017.8.31, Storage location: Driven by connected PC) *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission Spurious emission (Below 1 GHz)	11g Tx	2412 MHz
	BT LE 1M-PHY BT LE 2M-PHY	2402 MHz, 2440 MHz, 2480 MHz
Spurious Emission	11b Tx, 11g Tx, 11n-20 Tx	2412 MHz, 2437 MHz, 2462 MHz
	11n-40 Tx	2422 MHz, 2437 MHz, 2452 MHz
	BT LE 1M-PHY BT LE 2M-PHY	2402 MHz, 2440 MHz, 2480 MHz
	BT LE 1M-PHY with 11ac-40 Tx 5190 MHz BT LE 2M-PHY with 11ac-40 Tx 5190 MHz	2402 MHz, 2440 MHz, 2480 MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth	11b Tx, 11g Tx, 11n-20 Tx	2412 MHz, 2437 MHz, 2462 MHz
	11n-40 Tx	2422 MHz, 2437 MHz, 2452 MHz
	BT LE 1M-PHY BT LE 2M-PHY	2402 MHz, 2440 MHz, 2480 MHz

4.2 Configuration and peripherals



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.
*1) Conducted Emission test

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remarks
A	Antenna	-	1 (0.01 m) *2) 4 (0.2 m) *2)	Canon Inc.	EUT
B	Wireless LAN/Bluetooth Combo Module	ES204	16 *3) 17 *4)	Canon Inc.	EUT
C	Power Supply	PAN35-10A	ML002085	KIKUSUI	-
D	Grand Plate	-	-	Canon Inc	*5)

*2) The antenna used for the measurement was confirmed by pre-check, and Serial number 4 was used for the measurement.
*3) Used for Antenna Terminal conducted test
*4) Used for Conducted Emission test and Radiated Emission test
*5) Grand Plate for matching. Taking in consideration of antenna characteristics, the setup that does not affect spurious emissions was used.

List of cables used

No.	Name	Length (m)	Shield		Remarks
			Cable	Connector	
1	Coaxial	0.01 *6) 0.2 *7)	Shielded	Sshielded	-
2	DC	0.06 + 1.5	Unshielded	Unshielded	-
3	AC	1.8	Unshielded	Unshielded	-

*6) Used for Serial number 1 Antenna.
*7) Used for Serial number 4 Antenna.

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a urethane platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane.
The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80 cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

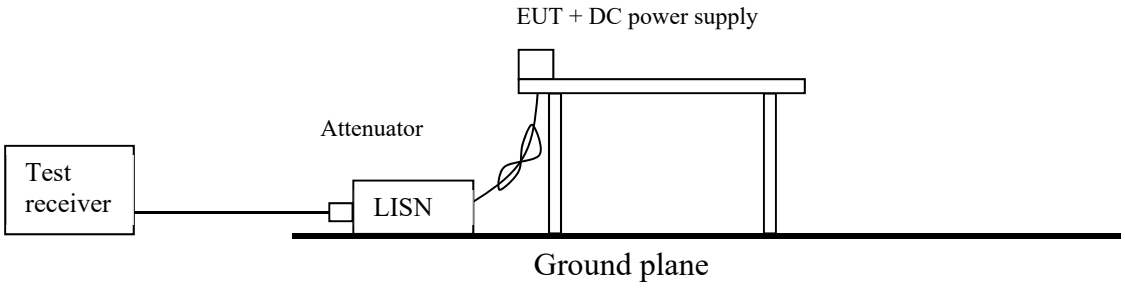
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT via DC power supply in a Semi Anechoic Chamber.
The EUT via DC power supply was connected to a LISN (AMN).
An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Detector : QP and CISPR AV
Measurement range : 0.15 MHz - 30 MHz
Test data : APPENDIX
Test result : Pass

Figure 1: Test Setup



SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "8.5 and 8.6 of KDB 558074 D01 15.247 Meas Guidance v05r02".

[For below 1 GHz]
EUT was placed on a platform of nominal size, 1.0 m by 2.0 m, raised 0.8 m above the conducting ground plane. The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 1.0 m, raised 1.5 m above the conducting ground plane. The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 m and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
Test antenna was aimed at the EUT for receiving the maximum signal and always kept within the illumination area of the 3 dB beamwidth of the antenna.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

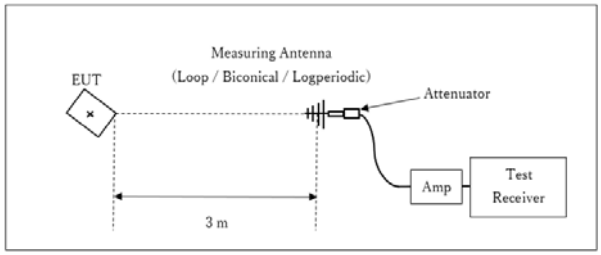
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(ISED) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (ISED).

Frequency	30 MHz to 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	11.12.2.5.2 RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (Linear voltage) Trace: 100 traces Duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on ANSI C63.10-2013.

Figure 1: Test Setup

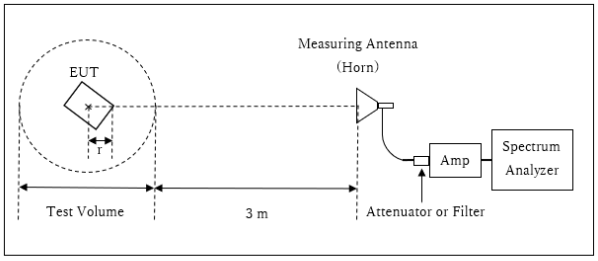
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 13 GHz

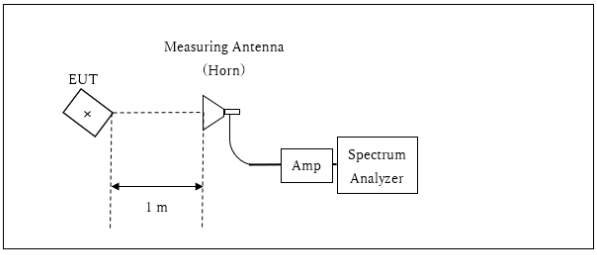


r : Radius of an outer periphery of EUT
× : Center of turn table

Distance Factor: 20 x log (3.93 m / 3.0 m) = 2.35 dB
* Test Distance: (3 + Test Volume /2) - r = 3.93 m

Test Volume : 2.0 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
r = 0.07 m

13 GHz – 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m / 3.0 m) = -9.54 dB
*Test Distance: 1 m

The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

WLAN
Module

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz – 2.8 GHz)	Spurious (2.8 GHz – 13 GHz)	Spurious (13 GHz – 18 GHz)	Spurious (18 GHz – 26.5 GHz)
Horizontal	Z	X	Z	Y	X	X
Vertical	Z	X	Z	Y	X	X

Antenna

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz – 2.8 GHz)	Spurious (2.8 GHz – 13 GHz)	Spurious (13 GHz – 18 GHz)	Spurious (18 GHz – 26.5 GHz)
Horizontal	X	X	X	Y	X	X
Vertical	Z	X	Z	X	X	X

BT LE
Module

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz – 2.8 GHz)	Spurious (2.8 GHz – 13 GHz)	Spurious (13 GHz – 18 GHz)	Spurious (18 GHz – 26.5 GHz)
Horizontal	Z	X	Z	X	X	X
Vertical	Z	X	Z	X	X	X

Antenna

Antenna polarization	Carrier	Spurious (30 MHz - 1 GHz)	Spurious (1 GHz – 2.8 GHz)	Spurious (2.8 GHz – 13 GHz)	Spurious (13 GHz – 18 GHz)	Spurious (18 GHz – 26.5 GHz)
Horizontal	X	X	X	X	X	X
Vertical	Z	Y	Z	X	X	X

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 30 MHz - 26.5 GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	Enough width to display emission skirts	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 50 MHz BW)
Peak Power Density	1.5 times the 6dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9kHz to 150kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150kHz to 30MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 11.10.2 Method PKPSD (peak PSD) of "ANSI C63.10-2013".
*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)

The test results and limit are rounded off to two decimals place, so some differences might be observed.
The equipment and cables were not used for factor 0 dB of the data sheets.

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2020/01/06

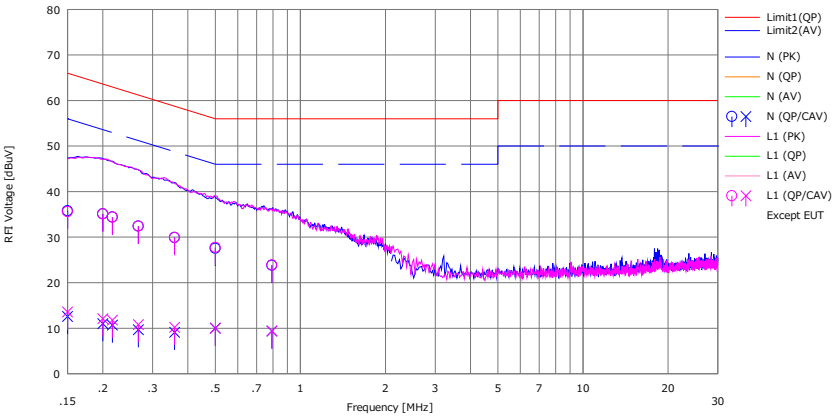
Mode : Tx 11g 2412 MHz

Power : DC 3.3 V (AC 120V/ 60 Hz)
Temp./Humi. : 25 deg.C / 30 %RH

Remarks : -

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Makoto Hosaka



No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		〈QP〉	〈CAV〉		〈QP〉	〈CAV〉	〈QP〉	〈AV〉	〈QP〉	〈AV〉		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	23.30	0.10	12.48	35.78	12.58	66.00	56.00	30.2	43.4	N	
2	0.20004	22.60	-1.50	12.50	35.10	11.00	63.61	53.61	28.5	42.6	N	
3	0.21636	21.90	-1.80	12.49	34.39	10.69	62.96	52.96	28.5	42.2	N	
4	0.26725	19.90	-2.80	12.49	32.39	9.69	61.20	51.20	28.8	41.5	N	
5	0.35889	17.40	-3.40	12.50	29.90	9.10	58.75	48.75	28.8	39.6	N	
6	0.50012	15.00	-2.50	12.53	27.53	10.03	56.00	46.00	28.4	35.9	N	
7	0.79335	11.20	-3.20	12.58	23.78	9.38	56.00	46.00	32.2	36.6	N	
8	0.15000	23.10	1.10	12.48	35.58	13.58	66.00	56.00	30.4	42.4	L1	
9	0.20004	22.60	-0.40	12.48	35.08	12.08	63.61	53.61	28.5	41.5	L1	
10	0.21636	21.90	-0.70	12.48	34.38	11.78	62.96	52.96	28.5	41.1	L1	
11	0.26725	19.90	-1.70	12.50	32.40	10.80	61.20	51.20	28.8	40.4	L1	
12	0.35889	17.40	-2.30	12.50	29.90	10.20	58.75	48.75	28.8	38.5	L1	
13	0.50012	15.20	-2.50	12.53	27.73	10.03	56.00	46.00	28.2	35.9	L1	
14	0.79335	11.30	-3.20	12.57	23.87	9.37	56.00	46.00	32.1	36.6	L1	

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN)= SLS-05

Conducted Emission

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2020/01/06

Mode : BLE 1M 2402 MHz

Power : DC 3.3 V (AC 120V/ 60 Hz)
Temp./Humi. : 25 deg.C / 30 %RH

Remarks : -

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Makoto Hosaka

<< QP/CAV DATA >>

No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		〈QP〉	〈CAV〉		〈QP〉	〈CAV〉	〈QP〉	〈AV〉	〈QP〉	〈AV〉		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	22.50	0.80	12.48	34.98	13.28	66.00	56.00	31.0	42.7	N	
2	0.19959	21.80	-0.80	12.50	34.30	11.70	63.63	53.63	29.3	41.9	N	
3	0.23016	20.40	-1.40	12.49	32.89	11.09	62.44	52.44	29.5	41.3	N	
4	0.27455	18.80	-1.50	12.49	31.29	10.99	60.98	50.98	29.6	39.9	N	
5	0.35072	17.00	-2.30	12.50	29.50	10.20	58.95	48.95	29.4	38.7	N	
6	0.50302	14.50	-2.60	12.53	27.03	9.93	56.00	46.00	28.9	36.0	N	
7	0.67434	11.90	-3.20	12.54	24.44	9.34	56.00	46.00	31.5	36.6	N	
8	0.15000	22.40	0.90	12.48	34.88	13.38	66.00	56.00	31.1	42.6	L1	
9	0.19959	21.80	-0.80	12.48	34.28	11.68	63.63	53.63	29.3	41.9	L1	
10	0.23016	20.40	-1.40	12.49	32.89	11.09	62.44	52.44	29.5	41.3	L1	
11	0.27455	18.80	-1.50	12.50	31.30	11.00	60.98	50.98	29.6	39.9	L1	
12	0.35072	17.00	-2.30	12.50	29.50	10.20	58.95	48.95	29.4	38.7	L1	
13	0.50302	14.60	-2.60	12.53	27.13	9.93	56.00	46.00	28.8	36.0	L1	
14	0.67434	12.10	-3.20	12.55	24.65	9.35	56.00	46.00	31.3	36.6	L1	

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN)= SLS-05

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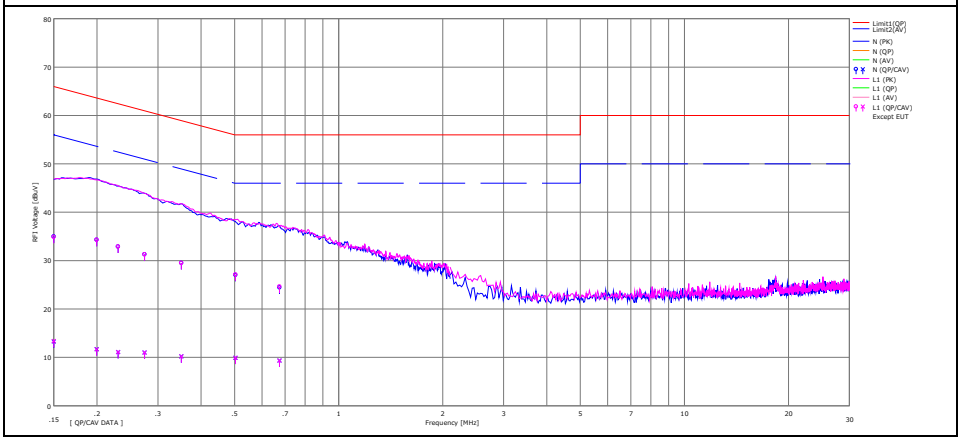
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
Facsimile : +81 463 50 6401

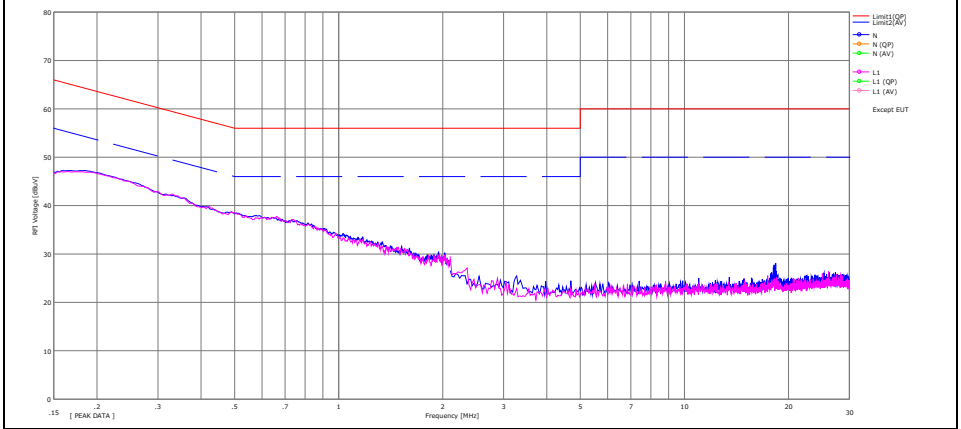
Conducted Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date	January 6, 2020
Temperature / Humidity	25 deg. C / 30 % RH
Engineer	Makoto Hosaka
Mode	Tx BT LE 1M-PHY

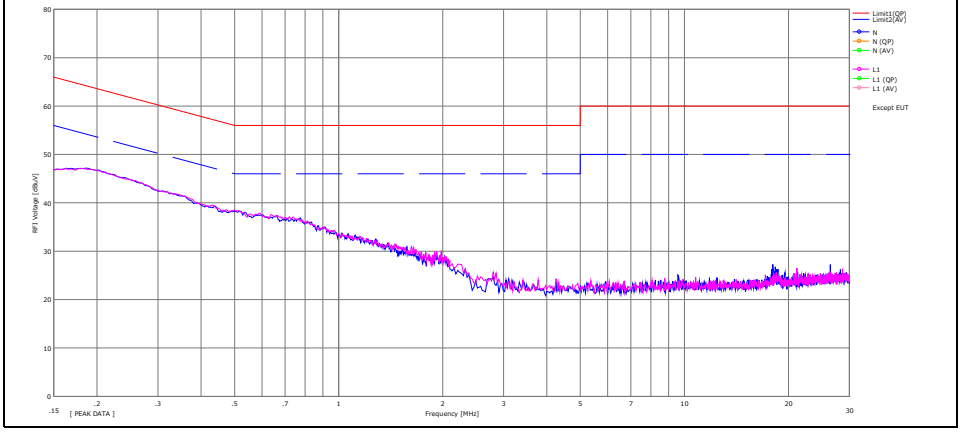
2402 MHz



2440 MHz



2480 MHz



Conducted Emission

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Semi-Anechoic Chamber
Date : 2020/01/07

Mode : BLE 2M 2402 MHz

Power : DC 3.3 V (AC 120V/ 60 Hz)
Temp./Humi. : 25 deg.C / 30 %RH

Remarks : -

Limit : FCC_Part 15 Subpart C(15.207)

Engineer : Makoto Hosaka

<< QP/CAV DATA >>

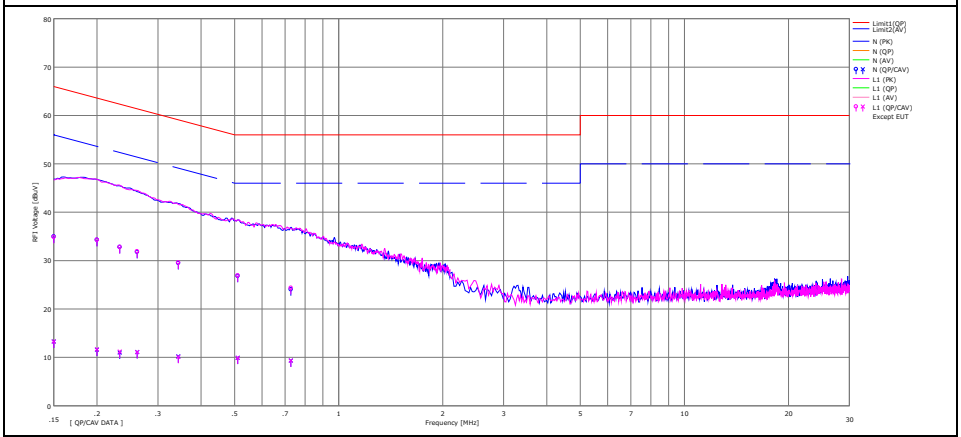
No.	Freq.	Reading		C.Fac	Results		Limit		Margin		Phase	Comment
		〈QP〉	〈CAV〉		〈QP〉	〈CAV〉	〈QP〉	〈AV〉	〈QP〉	〈AV〉		
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	22.50	0.80	12.48	34.98	13.28	66.00	56.00	31.0	42.7	N	
2	0.19986	21.80	-0.90	12.50	34.30	11.60	63.62	53.62	29.3	42.0	N	
3	0.23271	20.30	-1.50	12.49	32.79	10.99	62.35	52.35	29.5	41.3	N	
4	0.26121	19.30	-1.40	12.49	31.79	11.09	61.39	51.39	29.6	40.3	N	
5	0.34360	17.00	-2.30	12.50	29.50	10.20	59.12	49.12	29.6	38.9	N	
6	0.51054	14.30	-2.60	12.53	26.83	9.93	56.00	46.00	29.1	36.0	N	
7	0.72744	11.50	-3.20	12.56	24.06	9.36	56.00	46.00	31.9	36.6	N	
8	0.15000	22.40	0.80	12.48	34.88	13.28	66.00	56.00	31.1	42.7	L1	
9	0.19986	21.80	-0.80	12.48	34.28	11.68	63.62	53.62	29.3	41.9	L1	
10	0.23271	20.30	-1.30	12.49	32.79	11.19	62.35	52.35	29.5	41.1	L1	
11	0.26121	19.40	-1.40	12.50	31.90	11.10	61.39	51.39	29.4	40.2	L1	
12	0.34360	17.10	-2.40	12.50	29.60	10.10	59.12	49.12	29.5	39.0	L1	
13	0.51054	14.40	-2.60	12.53	26.93	9.93	56.00	46.00	29.0	36.0	L1	
14	0.72744	11.80	-3.20	12.56	24.36	9.36	56.00	46.00	31.6	36.6	L1	

Calculation:Result[dBuV]=Reading[dBuV]+C.Fac(LISN(AMN)+Cable+ATT)[dB]
LISN(AMN)= SLS-05

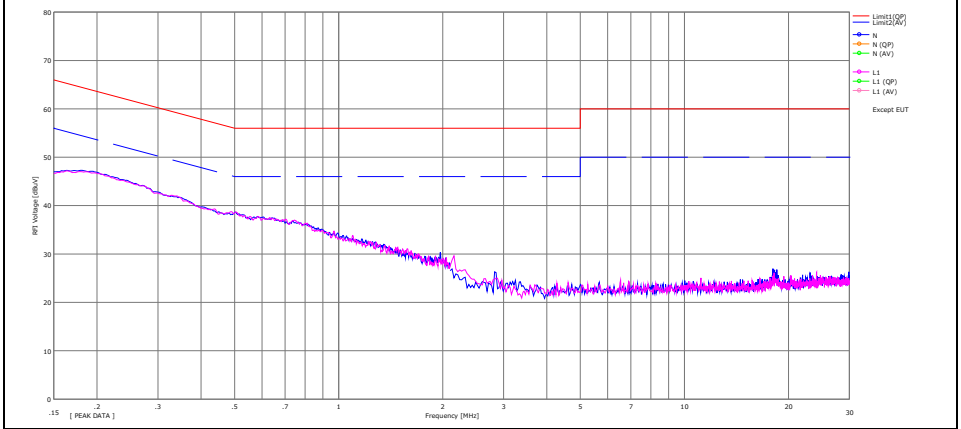
Conducted Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.3 Semi Anechoic Chamber
Date	January 7, 2020
Temperature / Humidity	25 deg. C / 30 % RH
Engineer	Makoto Hosaka
Mode	Tx BT LE 2M-PHY

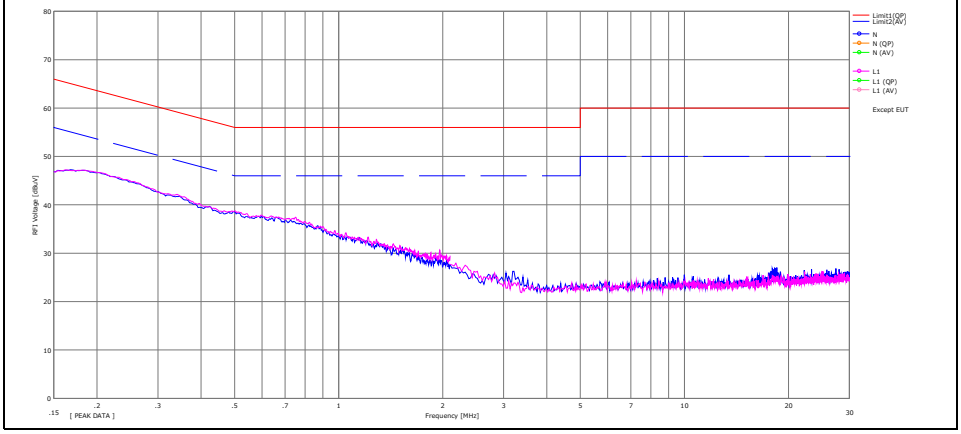
2402 MHz



2440 MHz



2480 MHz

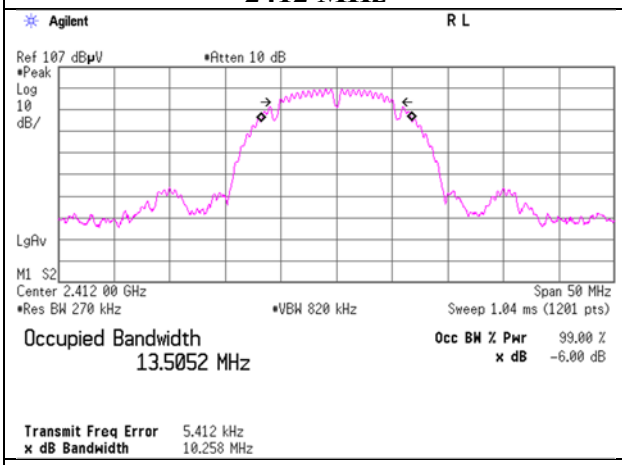
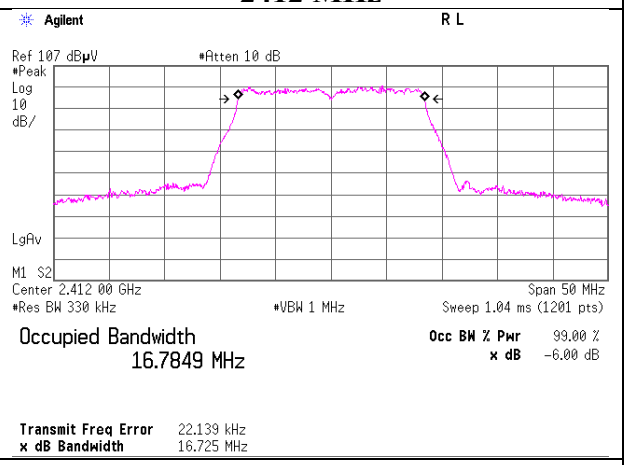
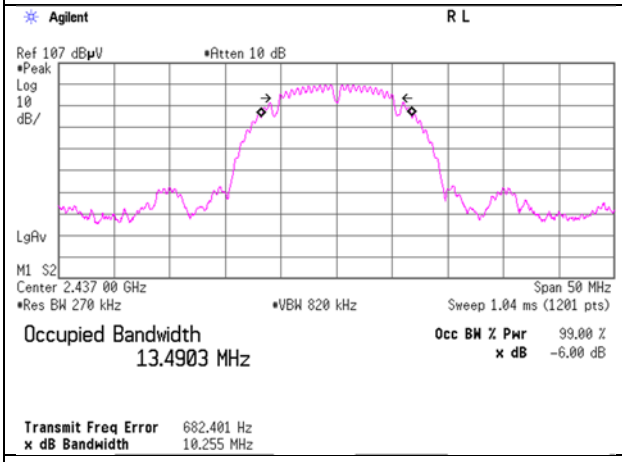
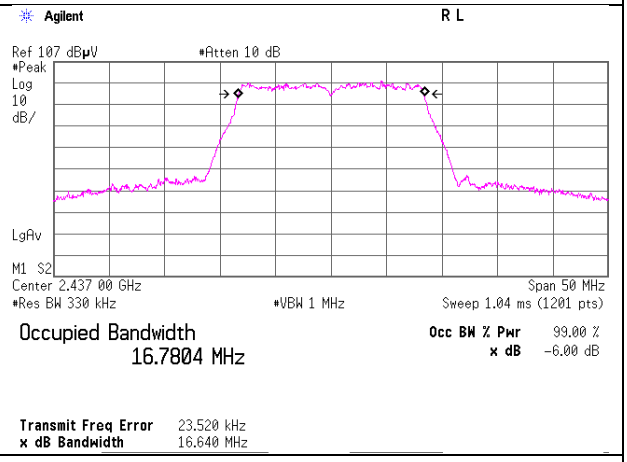
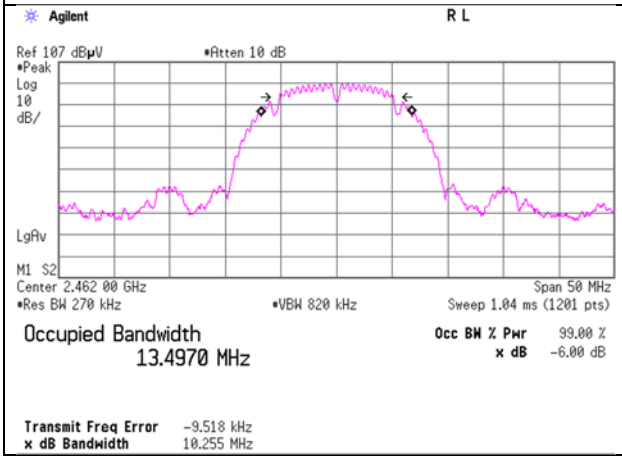
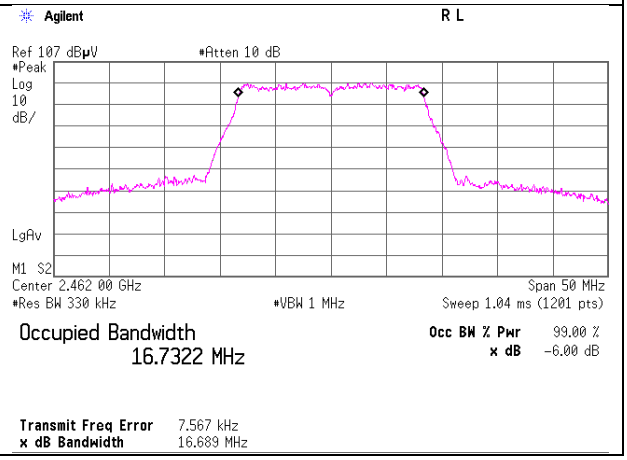


6 dB Bandwidth and 99 % Occupied Bandwidth

Report No.	13024969S-AC-R3	
Test place	Shonan EMC Lab. No.1 Measurement Room	
Date	November 9, 2019	December 2, 2019
Temperature / Humidity	24 deg. C / 45 % RH	20 deg. C / 45 % RH
Engineer	Kazuya Noda	Takahiro Kawakami
Mode	Tx	

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	13505.2	10.068	> 0.5000
	2437	13490.3	10.070	> 0.5000
	2462	13497.0	10.071	> 0.5000
11g	2412	16784.9	16.587	> 0.5000
	2437	16780.4	16.564	> 0.5000
	2462	16732.2	16.590	> 0.5000
11n-20	2412	17822.8	17.801	> 0.5000
	2437	17839.1	17.808	> 0.5000
	2462	17862.6	17.812	> 0.5000
11n-40	2422	36271.3	36.538	> 0.5000
	2437	36282.5	36.541	> 0.5000
	2452	36264.1	36.556	> 0.5000
BT LE 1M-PHY	2402	1031.8	0.734	> 0.5000
	2440	1032.1	0.724	> 0.5000
	2480	1031.9	0.732	> 0.5000
BT LE 2M-PHY	2402	2056.2	1.150	> 0.5000
	2440	2056.1	1.166	> 0.5000
	2480	2057.9	1.175	> 0.5000

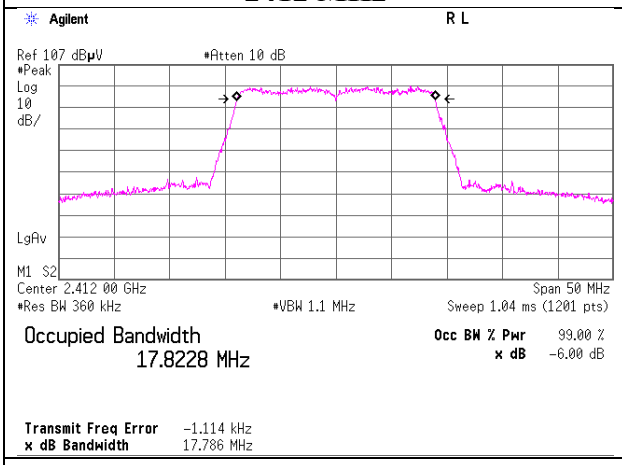
99 % Occupied Bandwidth

11b	11g
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

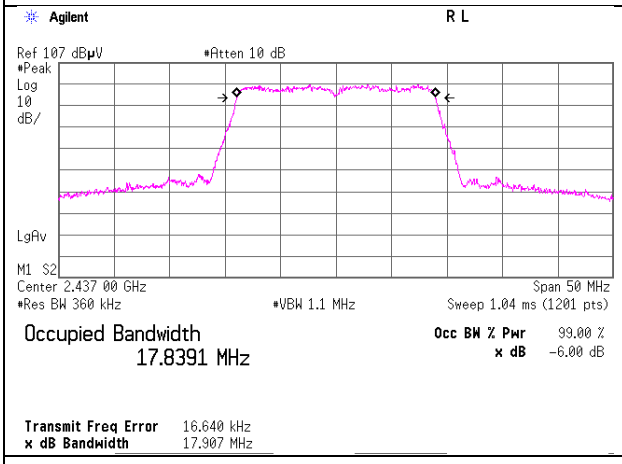
99 % Occupied Bandwidth

11n-20

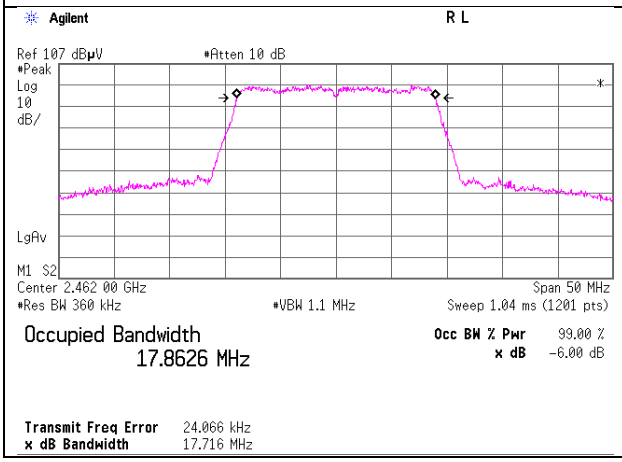
2412 MHz



2437 MHz

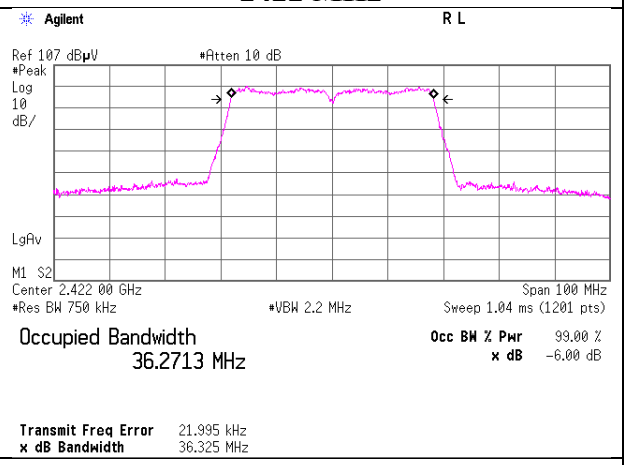


2462 MHz

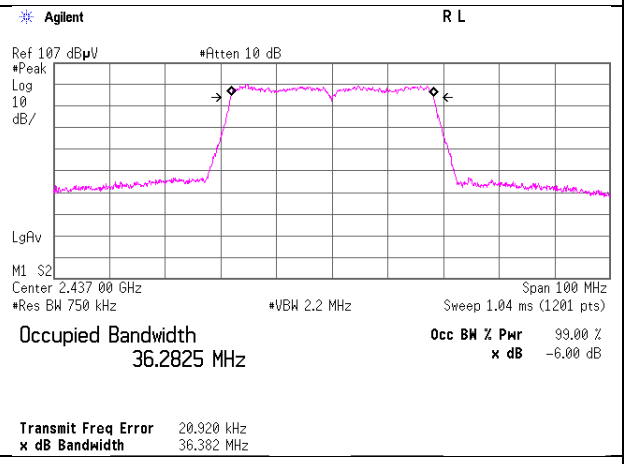


11n-40

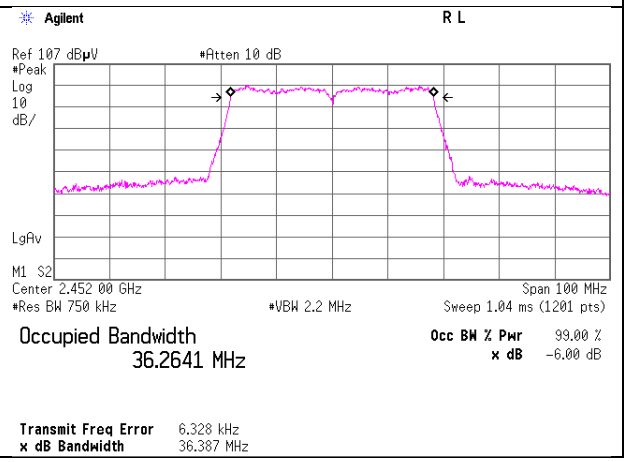
2422 MHz



2437 MHz



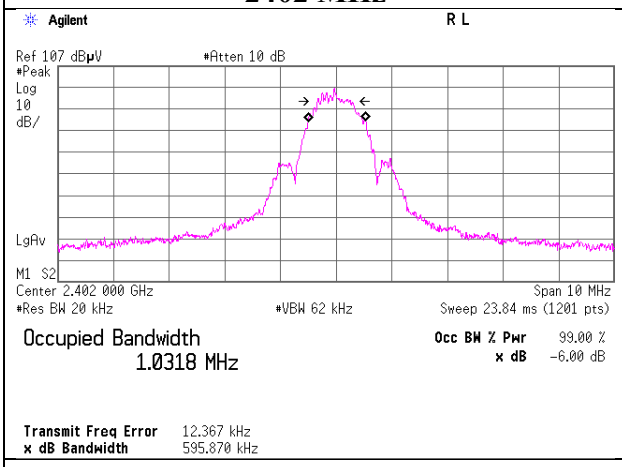
2452 MHz



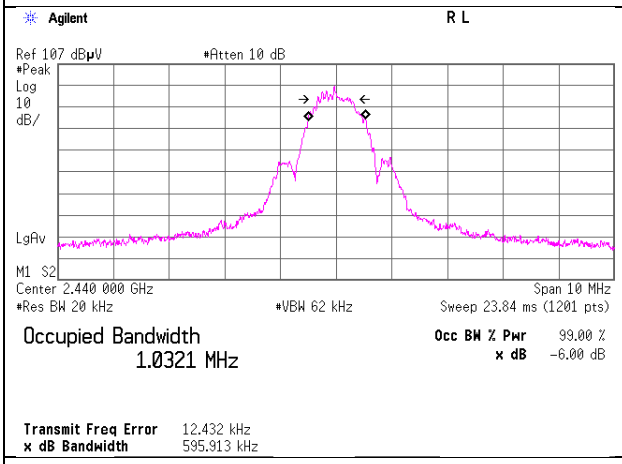
99 % Occupied Bandwidth

BT LE 1M-PHY

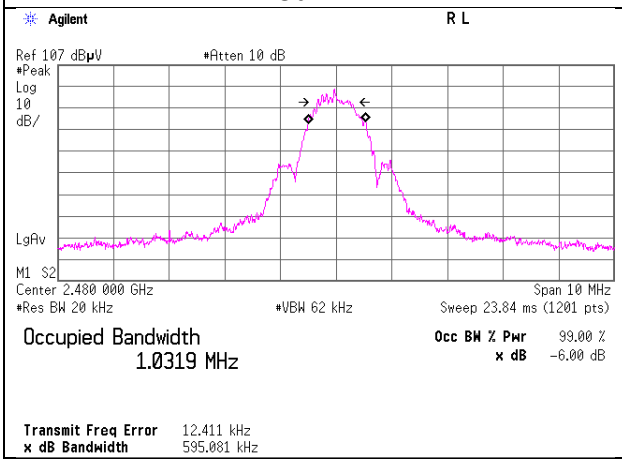
2402 MHz



2440 MHz

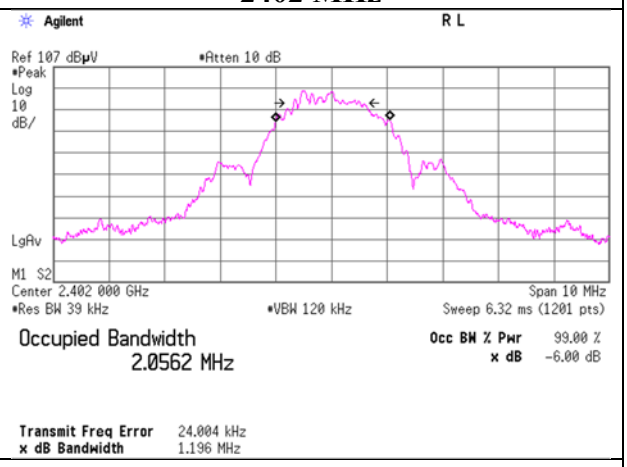


2480 MHz

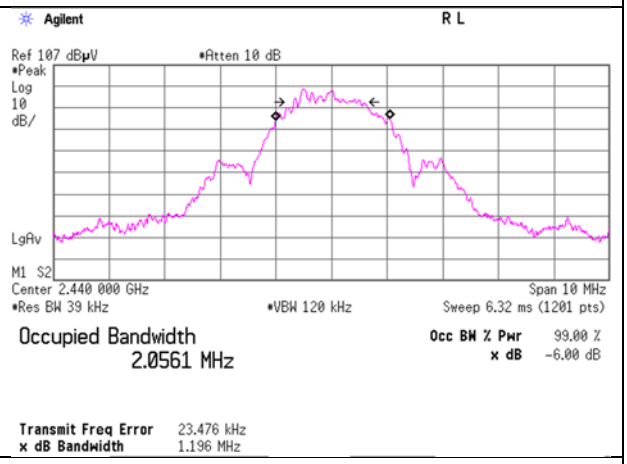


BT LE 2 M-PHY

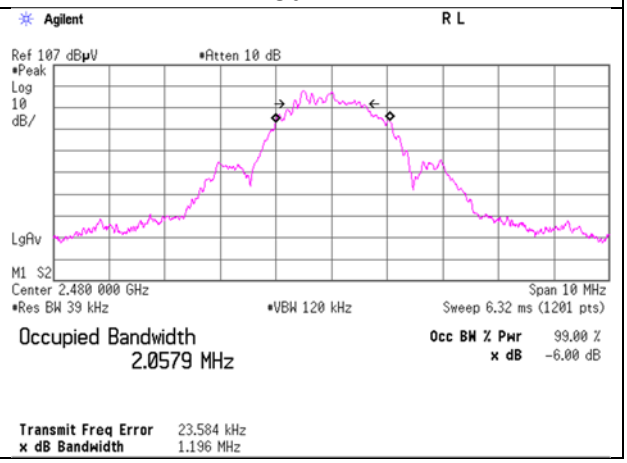
2402 MHz



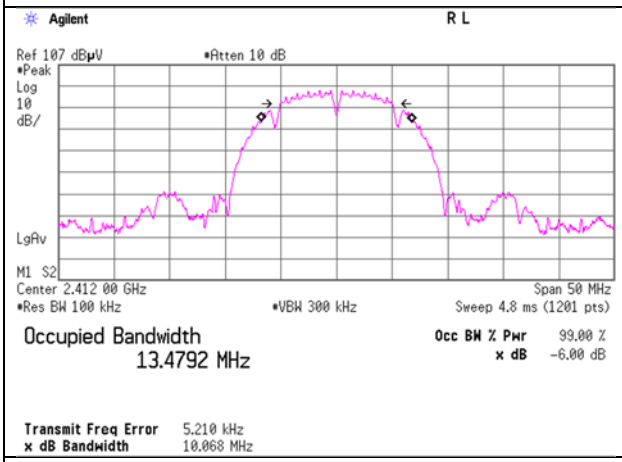
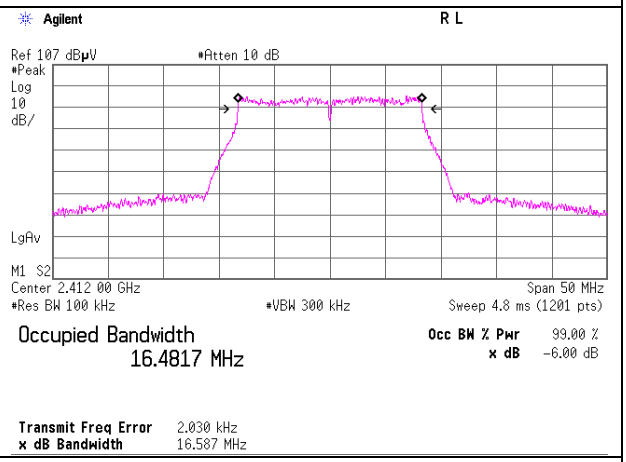
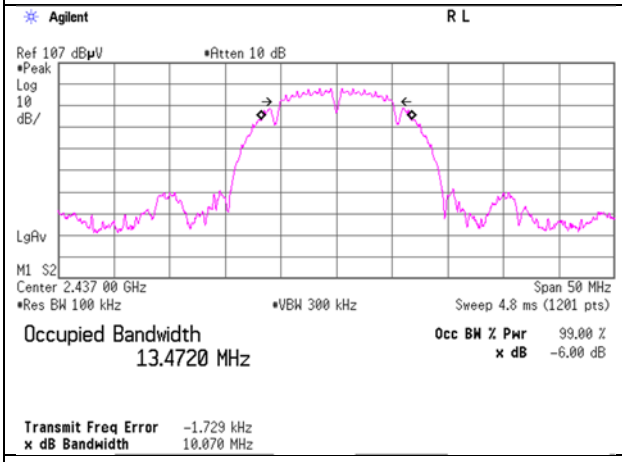
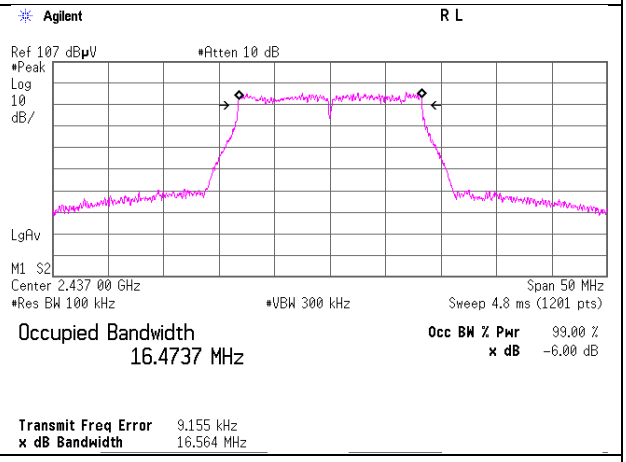
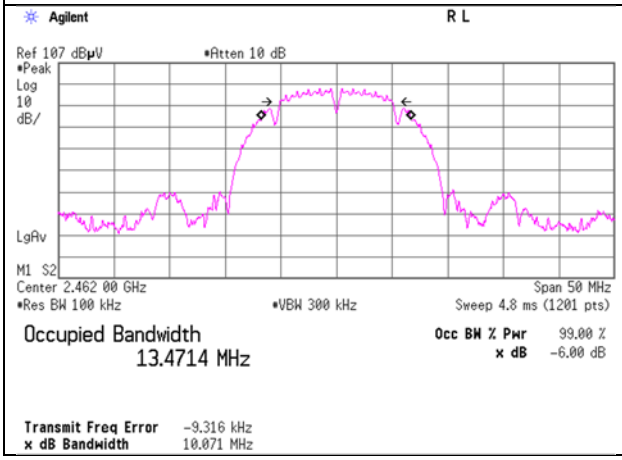
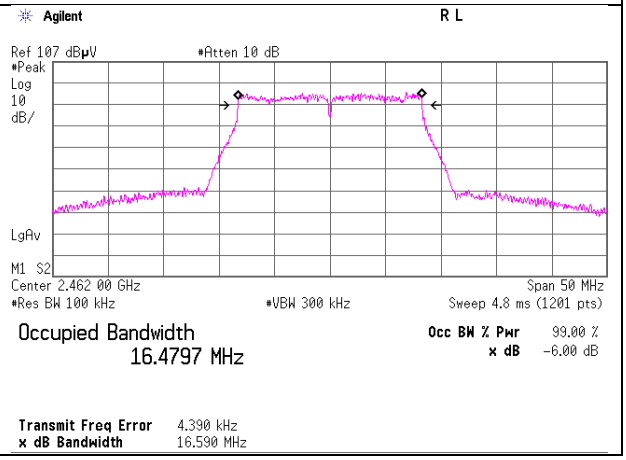
2440 MHz



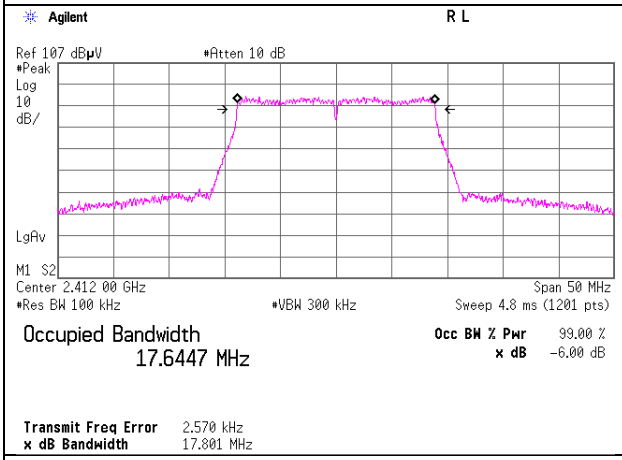
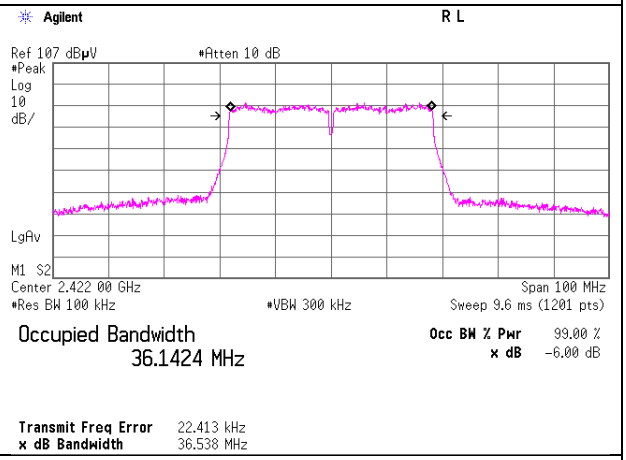
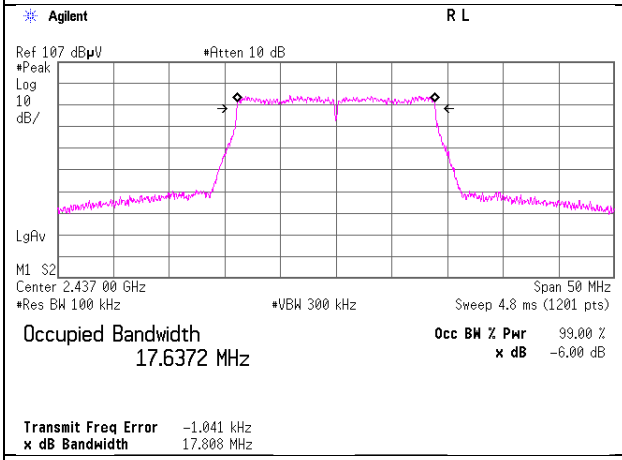
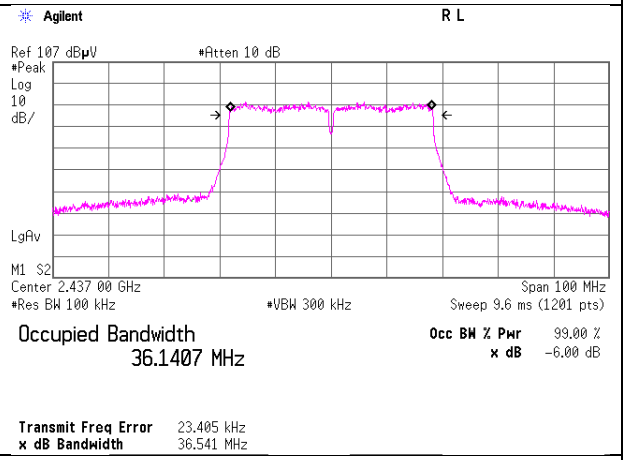
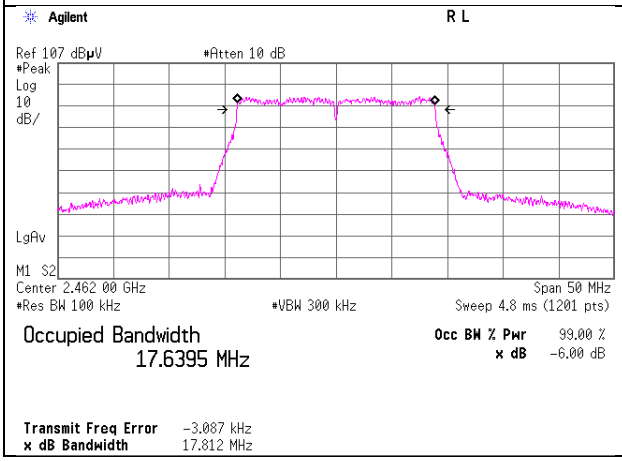
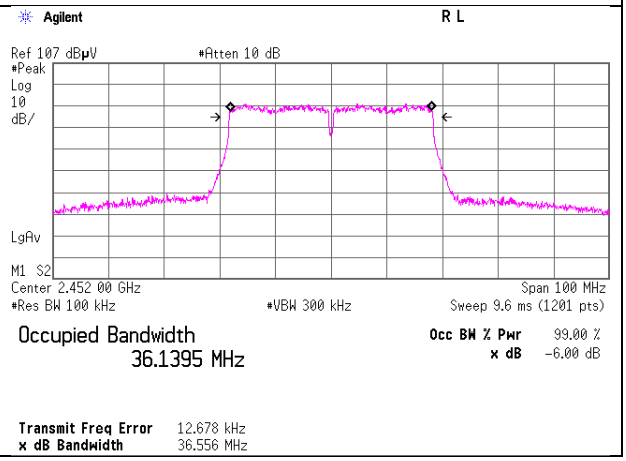
2480 MHz



6 dB Bandwidth

11b	11g
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

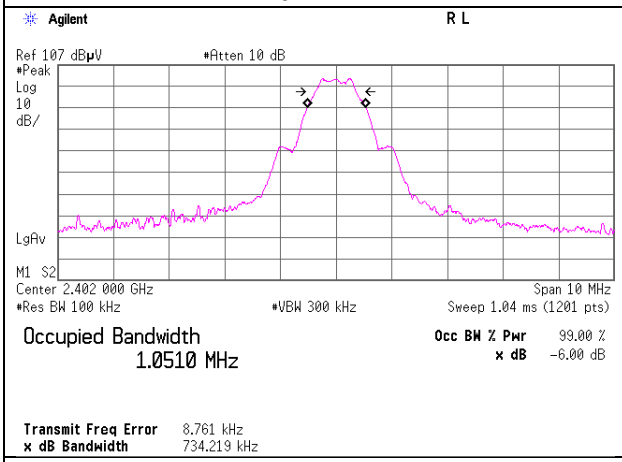
6 dB Bandwidth

11n-20	11n-40
2412 MHz	**2422 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2452 MHz**
	

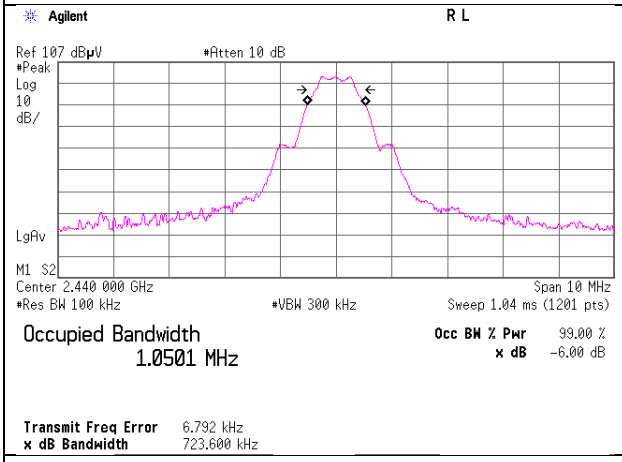
6 dB Bandwidth

BT LE 1 M-PHY

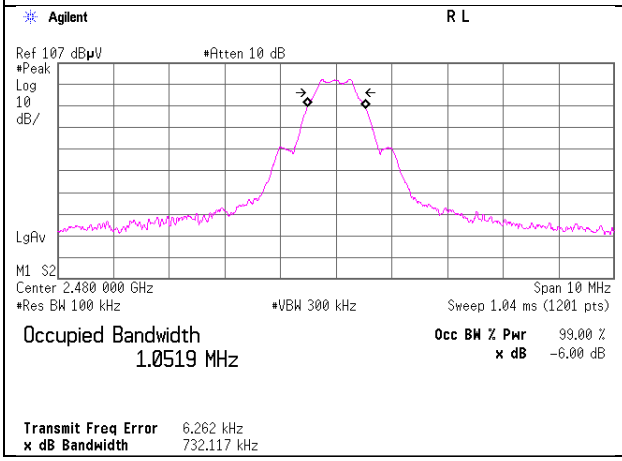
2402 MHz



2440 MHz

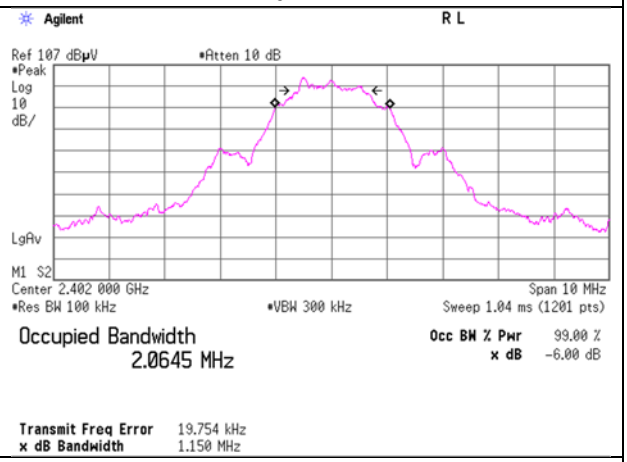


2480 MHz

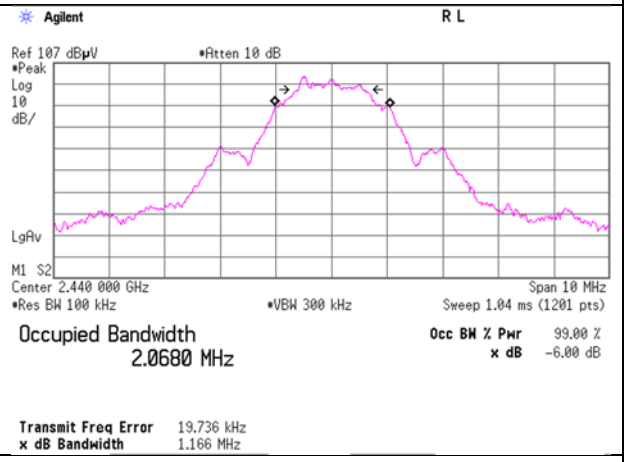


BT LE 2 M-PHY

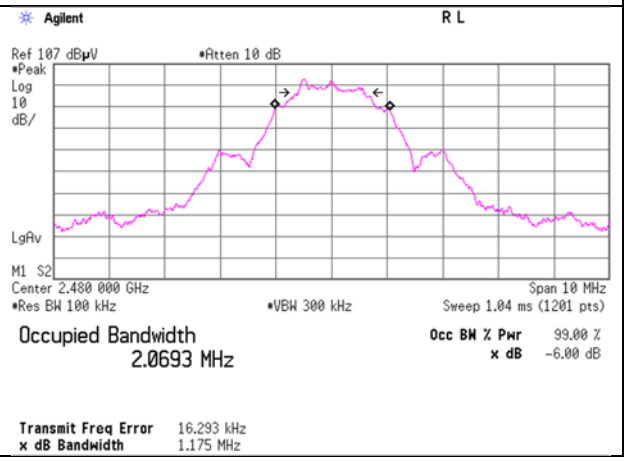
2402 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx 11b

11b				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	0.35	1.82	9.89	12.06	16.07	30.00	1000	17.94	2.98	15.04	31.92	36.02	4000	20.98
2437	0.28	1.83	9.89	12.00	15.85	30.00	1000	18.00	2.98	14.98	31.48	36.02	4000	21.04
2462	0.27	1.84	9.89	12.00	15.85	30.00	1000	18.00	2.98	14.98	31.48	36.02	4000	21.04

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	0.35	*
2	0.31	
5.5	-0.41	
11	0.28	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx 11g

11g				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	8.29	1.82	9.89	20.00	100.00	30.00	1000	10.00	2.98	22.98	198.61	36.02	4000	13.04
2437	8.12	1.83	9.89	19.84	96.38	30.00	1000	10.16	2.98	22.82	191.43	36.02	4000	13.20
2462	8.04	1.84	9.89	19.77	94.84	30.00	1000	10.23	2.98	22.75	188.36	36.02	4000	13.27

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	8.19	
9	8.23	
12	8.12	
18	7.63	
24	7.94	
36	7.29	
48	7.42	
54	8.29	*

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-20

11n-20				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	7.83	1.82	9.89	19.54	89.95	30.00	1000	10.46	2.98	22.52	178.65	36.02	4000	13.50
2437	7.76	1.83	9.89	19.48	88.72	30.00	1000	10.52	2.98	22.46	176.20	36.02	4000	13.56
2462	7.55	1.84	9.89	19.28	84.72	30.00	1000	10.72	2.98	22.26	168.27	36.02	4000	13.76

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

2437 MHz

MCS No.	Reading [dBm]	Remark
0	6.67	
1	6.75	
2	7.67	
3	6.68	
4	7.83	*
5	6.62	
6	7.56	
7	7.12	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx 11n-40

11n-40				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2422	7.96	1.82	9.89	19.67	92.68	30.00	1000	10.33	2.98	22.65	184.08	36.02	4000	13.37
2437	7.78	1.83	9.89	19.50	89.13	30.00	1000	10.50	2.98	22.48	177.01	36.02	4000	13.54
2452	7.71	1.83	9.89	19.43	87.70	30.00	1000	10.57	2.98	22.41	174.18	36.02	4000	13.61

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

2422 MHz

MCS No.	Reading [dBm]	Remark
0	6.61	
1	6.51	
2	7.65	
3	7.96	*
4	7.79	
5	7.49	
6	7.63	
7	7.66	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx BT LE

BT LE 1M-PHY				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-5.66	1.81	9.89	6.04	4.02	30.00	1000	23.96	2.98	9.02	7.98	36.02	4000	27.00
2440	-6.00	1.83	9.89	5.72	3.73	30.00	1000	24.28	2.98	8.70	7.41	36.02	4000	27.32
2480	-6.76	1.84	9.89	4.97	3.14	30.00	1000	25.03	2.98	7.95	6.24	36.02	4000	28.07

BT LE 2M-PHY				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-5.65	1.81	9.89	6.05	4.03	30.00	1000	23.95	2.98	9.03	8.00	36.02	4000	26.99
2440	-5.96	1.83	9.89	5.76	3.77	30.00	1000	24.24	2.98	8.74	7.48	36.02	4000	27.28
2480	-6.75	1.84	9.89	4.98	3.15	30.00	1000	25.02	2.98	7.96	6.25	36.02	4000	28.06

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

Average Output Power
(Reference data for RF Exposure)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx

11b **1 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-2.35	1.82	9.89	9.36	8.63	0.00	9.36	8.63
2437	-2.48	1.83	9.89	9.24	8.39	0.00	9.24	8.39
2462	-2.50	1.84	9.89	9.23	8.38	0.00	9.23	8.38

11g **6 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-2.49	1.82	9.89	9.22	8.36	0.00	9.22	8.36
2437	-2.56	1.83	9.89	9.16	8.24	0.00	9.16	8.24
2462	-2.54	1.84	9.89	9.19	8.30	0.00	9.19	8.30

11n-20 **MCS 0**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	-3.29	1.82	9.89	8.42	6.95	0.00	8.42	6.95
2437	-3.38	1.83	9.89	8.34	6.82	0.00	8.34	6.82
2462	-3.39	1.84	9.89	8.34	6.82	0.00	8.34	6.82

11n-40 **MCS 0**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2422	-3.25	1.82	9.89	8.46	7.01	0.00	8.46	7.01
2437	-3.39	1.83	9.89	8.33	6.81	0.00	8.33	6.81
2452	-3.37	1.83	9.89	8.35	6.84	0.00	8.35	6.84

Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Average Output Power
(Reference data for RF Exposure)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx BT LE

BT LE 1M-PHY

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-7.90	1.81	9.89	3.80	2.40	1.96	5.76	3.77
2440	-8.26	1.83	9.89	3.46	2.22	1.96	5.42	3.48
2480	-9.06	1.84	9.89	2.67	1.85	1.96	4.63	2.90

BT LE 2M-PHY

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-10.64	1.81	9.89	1.06	1.28	4.63	5.69	3.71
2440	-10.99	1.83	9.89	0.73	1.18	4.63	5.36	3.44
2480	-11.80	1.84	9.89	-0.07	0.98	4.63	4.56	2.86

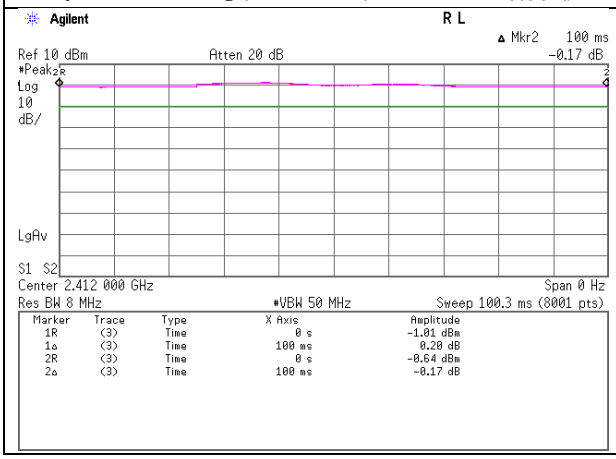
Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

Burst rate confirmation(for WLAN Average Output Power)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx

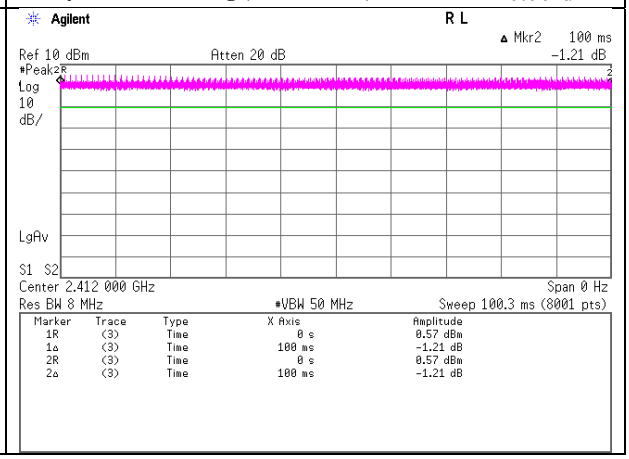
11b 1Mbps

Tx on / (Tx on + Tx off) = 1.000
Tx on / (Tx on + Tx off) * 100 = 100.0 %
Duty factor = 10 * log (100.3 / 100.3) = 0.00 dB



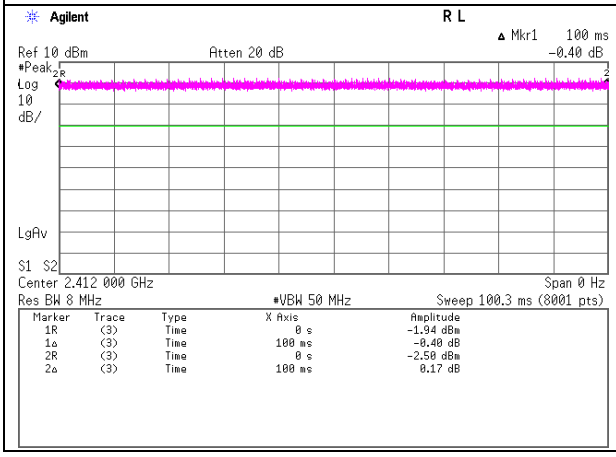
11g 6 Mbps

Tx on / (Tx on + Tx off) = 1.000
Tx on / (Tx on + Tx off) * 100 = 100.0 %
Duty factor = 10 * log (100.3 / 100.3) = 0.00 dB



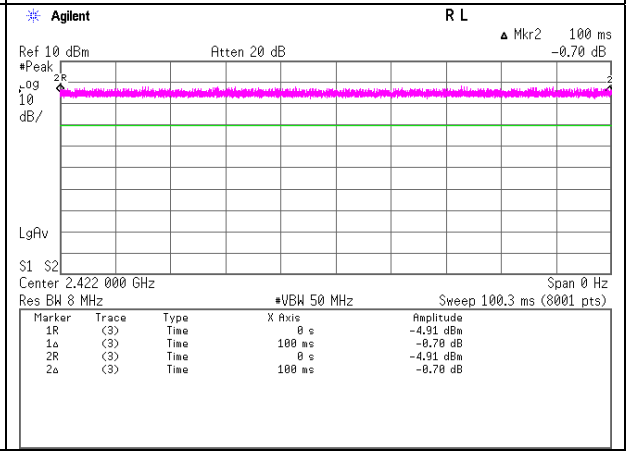
11n-20 MCS 0

Tx on / (Tx on + Tx off) = 1.000
Tx on / (Tx on + Tx off) * 100 = 100.0 %
Duty factor = 10 * log (100.3 / 100.3) = 0.00 dB



11n-40 MCS 0

Tx on / (Tx on + Tx off) = 1.000
Tx on / (Tx on + Tx off) * 100 = 100.0 %
Duty factor = 10 * log (100.3 / 100.3) = 0.00 dB



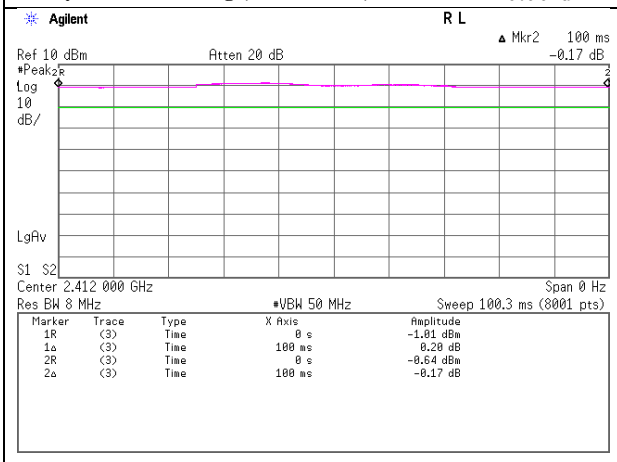
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation(for WLAN Radiated Spurious Emission)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx

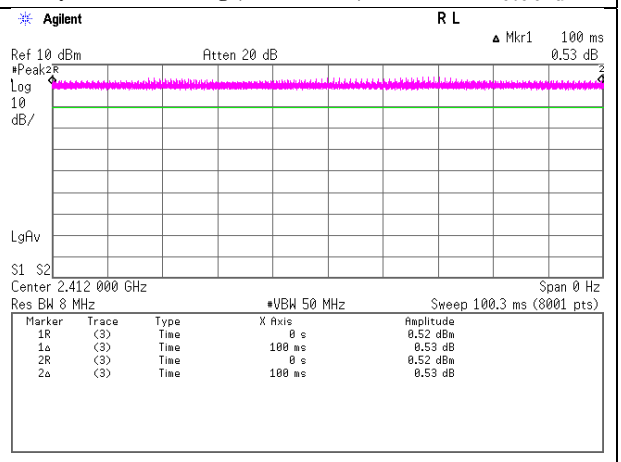
11b 1 Mbps

Tx on / (Tx on + Tx off) = 1.000
Tx on / (Tx on + Tx off) * 100 = 100.0 %
Duty factor = 20 * log (100.3 / 100.3) = 0.00 dB



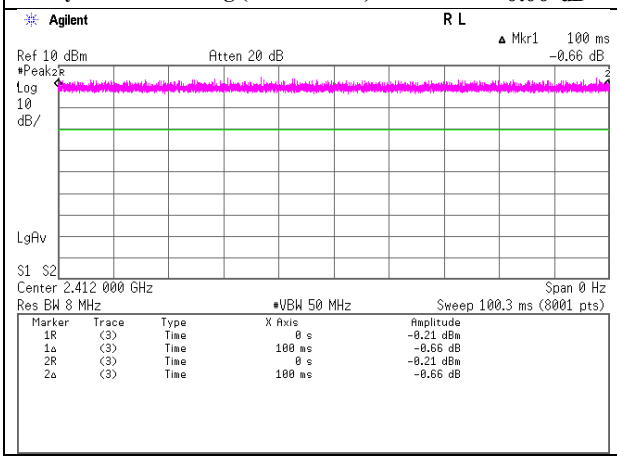
11g 54 Mbps

Tx on / (Tx on + Tx off) = 1.000
Tx on / (Tx on + Tx off) * 100 = 100.0 %
Duty factor = 20 * log (100.3 / 100.3) = 0.00 dB



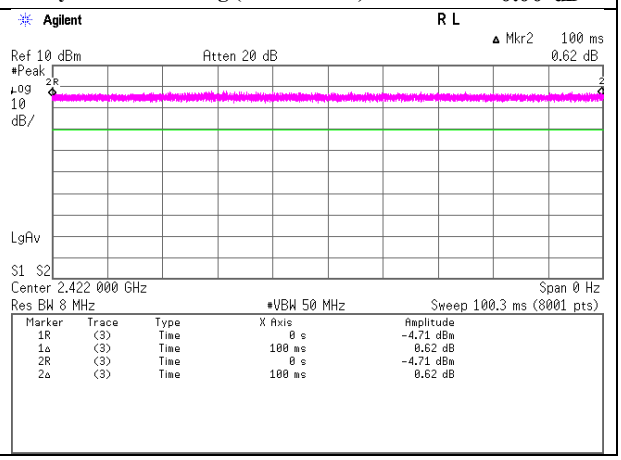
11n-20 MCS 4

Tx on / (Tx on + Tx off) = 1.000
Tx on / (Tx on + Tx off) * 100 = 100.0 %
Duty factor = 20 * log (100.3 / 100.3) = 0.00 dB



11n-40 MCS 3

Tx on / (Tx on + Tx off) = 1.000
Tx on / (Tx on + Tx off) * 100 = 100.0 %
Duty factor = 20 * log (100.3 / 100.3) = 0.00 dB



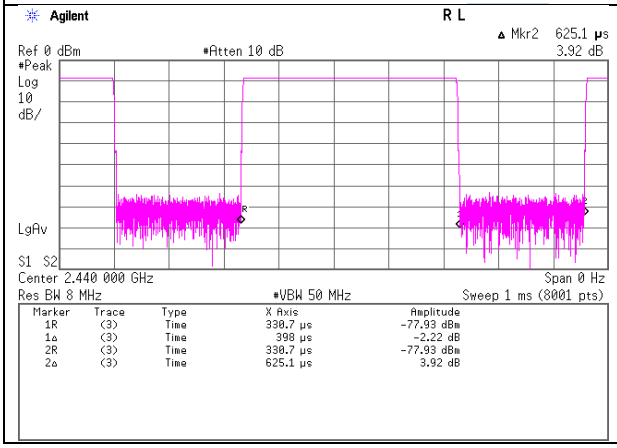
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation(for BT LE)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx BT LE

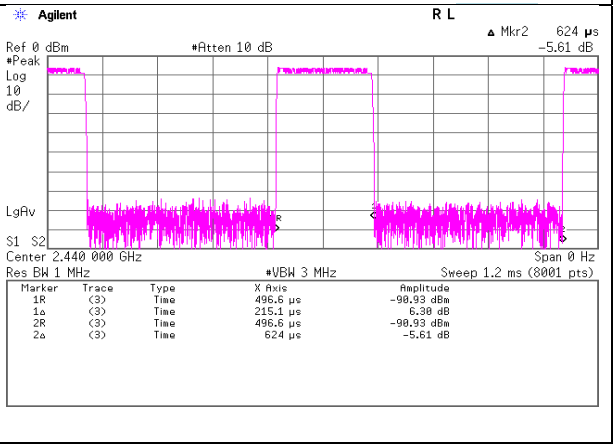
BT LE 1 M-PHY

Tx on / (Tx on + Tx off) =	**0.637**
Tx on / (Tx on + Tx off) * 100 =	**63.7 %**
Duty factor = 10 * log (0.625 / 0.398) =	**1.96 dB**
Duty factor = 20 * log (0.625 / 0.398) =	**3.92 dB**



BT LE 2 M-PHY

Tx on / (Tx on + Tx off) =	**0.345**
Tx on / (Tx on + Tx off) * 100 =	**34.5 %**
Duty factor = 10 * log (0.624 / 0.215) =	**4.63 dB**
Duty factor = 20 * log (0.624 / 0.215) =	**9.26 dB**



* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Radiated Spurious Emission

Report No.	13024969S-AC-R3		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	November 11, 2019	November 12, 2019	November 13, 2019
Temperature / Humidity	22 deg. C / 41 % RH	23 deg. C / 45 % RH	22 deg. C / 44 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda
	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11b 2412 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2387.640	PK	50.20	28.52	14.11	38.68	2.35	56.50	73.9	17.4	152	83	
Hori.	2390.000	PK	47.86	28.51	14.11	38.68	2.35	54.15	73.9	19.7	152	83	
Hori.	4824.000	PK	48.60	31.71	6.41	38.55	2.35	50.52	73.9	23.3	124	325	
Hori.	7236.000	PK	44.60	37.32	7.94	39.20	2.35	53.01	73.9	20.8	150	0	
Hori.	9648.000	PK	44.90	38.93	9.25	39.71	2.35	55.72	73.9	18.1	110	4	
Hori.	2387.640	AV	39.43	28.52	14.11	38.68	2.35	45.73	53.9	8.1	152	83	
Hori.	2390.000	AV	38.97	28.51	14.11	38.68	2.35	45.26	53.9	8.6	152	83	
Hori.	4824.000	AV	43.22	31.71	6.41	38.55	2.35	45.14	53.9	8.7	124	325	
Hori.	7236.000	AV	35.54	37.32	7.94	39.20	2.35	43.95	53.9	9.9	150	0	
Hori.	9648.000	AV	36.32	38.93	9.25	39.71	2.35	47.14	53.9	**6.7**	110	4	
Vert.	2388.825	PK	48.71	28.51	14.11	38.68	2.35	55.00	73.9	18.9	167	175	
Vert.	2390.000	PK	48.22	28.51	14.11	38.68	2.35	54.51	73.9	19.3	167	175	
Vert.	4824.000	PK	48.52	31.71	6.41	38.55	2.35	50.44	73.9	23.4	104	15	
Vert.	7236.000	PK	45.11	37.32	7.94	39.20	2.35	53.52	73.9	20.3	150	0	
Vert.	9648.000	PK	44.66	38.93	9.25	39.71	2.35	55.48	73.9	18.4	150	0	
Vert.	2388.825	AV	39.85	28.51	14.11	38.68	2.35	46.14	53.9	7.7	167	175	
Vert.	2390.000	AV	39.33	28.51	14.11	38.68	2.35	45.62	53.9	8.2	167	175	
Vert.	4824.000	AV	42.54	31.71	6.41	38.55	2.35	44.46	53.9	9.4	104	15	
Vert.	7236.000	AV	35.28	37.32	7.94	39.20	2.35	43.69	53.9	10.2	150	0	
Vert.	9648.000	AV	36.11	38.93	9.25	39.71	2.35	46.93	53.9	6.9	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

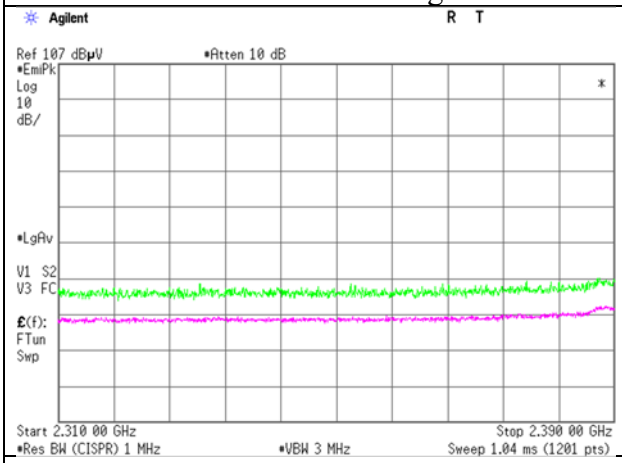
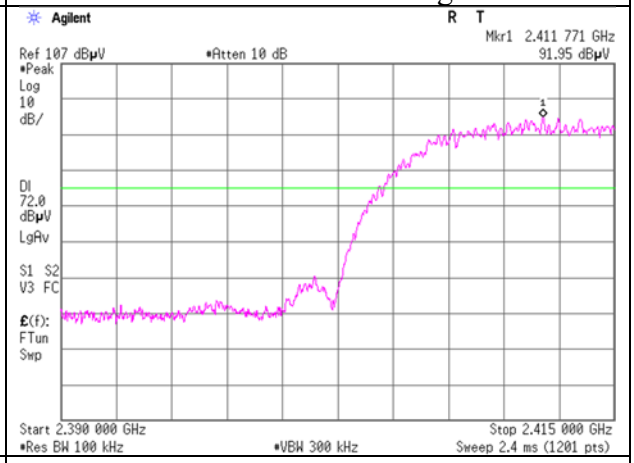
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

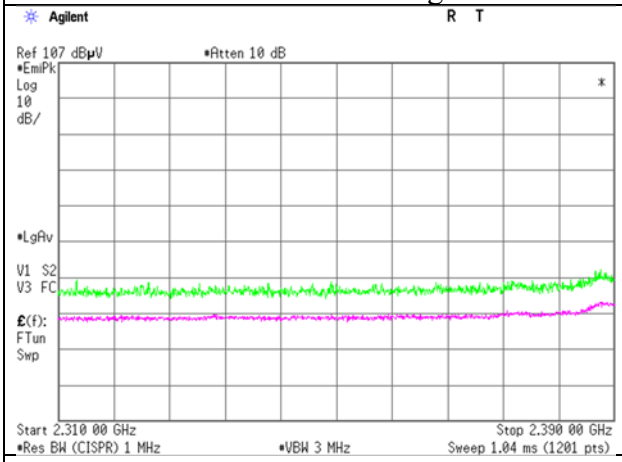
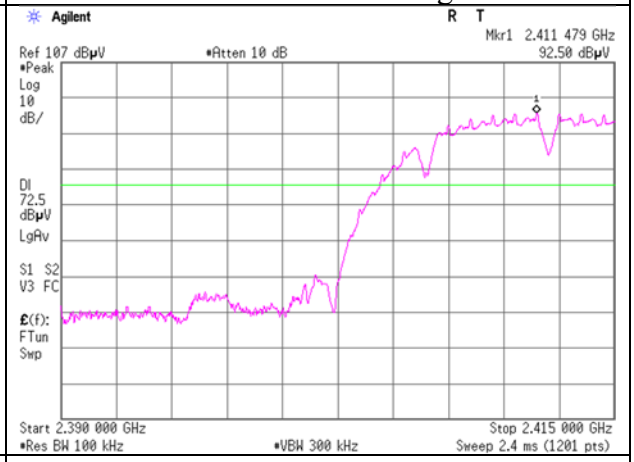
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	91.72	28.46	14.13	38.67	2.35	97.99	-	-	Carrier
Hori.	2400.000	PK	39.04	28.48	14.12	38.67	2.35	45.32	77.99	32.6	
Vert.	2412.000	PK	92.56	28.46	14.13	38.67	2.35	98.83	-	-	Carrier
Vert.	2400.000	PK	40.29	28.48	14.12	38.67	2.35	46.57	78.83	32.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	November 11, 2019
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Kazuya Noda
Mode	Tx 11b 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	November 12, 2019	November 13, 2019
Temperature / Humidity	23 deg. C / 45 % RH	22 deg. C / 44 % RH
Engineer	Kazuya Noda	Kazuya Noda
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11b 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	48.61	31.73	6.45	38.55	2.35	50.59	73.9	23.3	121	325	
Hori.	7311.000	PK	45.29	37.40	8.02	39.31	2.35	53.75	73.9	20.1	150	0	
Hori.	9748.000	PK	45.77	39.32	9.26	39.64	2.35	57.06	73.9	16.8	138	353	
Hori.	4874.000	AV	43.80	31.73	6.45	38.55	2.35	45.78	53.9	8.1	121	325	
Hori.	7311.000	AV	35.69	37.40	8.02	39.31	2.35	44.15	53.9	9.7	150	0	
Hori.	9748.000	AV	36.31	39.32	9.26	39.64	2.35	47.60	53.9	6.3	138	353	
Vert.	4874.000	PK	48.61	31.73	6.45	38.55	2.35	50.59	73.9	23.3	103	20	
Vert.	7311.000	PK	44.95	37.40	8.02	39.31	2.35	53.41	73.9	20.4	150	0	
Vert.	9748.000	PK	45.36	39.32	9.26	39.64	2.35	56.65	73.9	17.2	150	0	
Vert.	4874.000	AV	43.34	31.73	6.45	38.55	2.35	45.32	53.9	8.5	103	20	
Vert.	7311.000	AV	35.74	37.40	8.02	39.31	2.35	44.20	53.9	9.7	150	0	
Vert.	9748.000	AV	36.33	39.32	9.26	39.64	2.35	47.62	53.9	**6.2**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13024969S-AC-R3		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	November 11, 2019	November 12, 2019	November 13, 2019
Temperature / Humidity	22 deg. C / 41 % RH	23 deg. C / 45 % RH	22 deg. C / 44 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda
	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11b 2462 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	46.91	28.35	14.19	38.62	2.35	53.18	73.9	20.7	260	92	
Hori.	2487.571	PK	47.24	28.34	14.19	38.62	2.35	53.50	73.9	20.4	260	92	
Hori.	4924.000	PK	49.13	31.85	6.48	38.55	2.35	51.26	73.9	22.6	145	330	
Hori.	7386.000	PK	45.36	37.51	8.08	39.43	2.35	53.87	73.9	20.0	150	0	
Hori.	9848.000	PK	45.91	39.50	9.26	39.56	2.35	57.46	73.9	16.4	126	355	
Hori.	2483.500	AV	38.65	28.35	14.19	38.62	2.35	44.92	53.9	8.9	260	92	
Hori.	2487.571	AV	39.99	28.34	14.19	38.62	2.35	46.25	53.9	7.6	260	92	
Hori.	4924.000	AV	44.48	31.85	6.48	38.55	2.35	46.61	53.9	7.2	145	330	
Hori.	7386.000	AV	35.80	37.51	8.08	39.43	2.35	44.31	53.9	9.5	150	0	
Hori.	9848.000	AV	36.63	39.50	9.26	39.56	2.35	48.18	53.9	**5.7**	126	355	
Vert.	2483.500	PK	46.80	28.35	14.19	38.62	2.35	53.07	73.9	20.8	233	186	
Vert.	2488.361	PK	46.72	28.34	14.19	38.62	2.35	52.98	73.9	20.9	233	186	
Vert.	4924.000	PK	48.34	31.85	6.48	38.55	2.35	50.47	73.9	23.4	144	14	
Vert.	7386.000	PK	45.49	37.51	8.08	39.43	2.35	54.00	73.9	19.9	150	0	
Vert.	9848.000	PK	45.66	39.50	9.26	39.56	2.35	57.21	73.9	16.6	150	0	
Vert.	2483.500	AV	38.49	28.35	14.19	38.62	2.35	44.76	53.9	9.1	233	186	
Vert.	2488.361	AV	39.71	28.34	14.19	38.62	2.35	45.97	53.9	7.9	233	186	
Vert.	4924.000	AV	43.98	31.85	6.48	38.55	2.35	46.11	53.9	7.8	144	14	
Vert.	7386.000	AV	35.78	37.51	8.08	39.43	2.35	44.29	53.9	9.6	150	0	
Vert.	9848.000	AV	36.18	39.50	9.26	39.56	2.35	47.73	53.9	6.1	150	0	

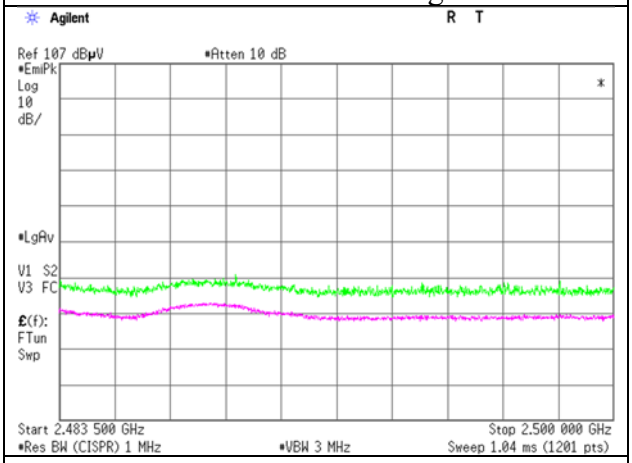
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	November 11, 2019
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Kazuya Noda
Mode	Tx 11b 2462 MHz

Horizontal

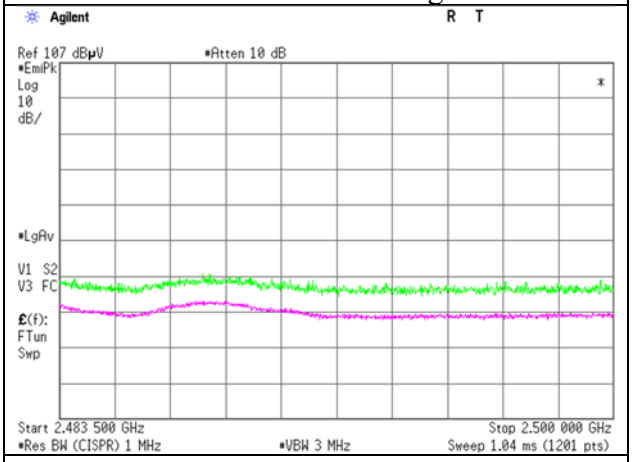
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.2	No.2
Date	December 12, 2019	November 12, 2019	November 13, 2019	November 13, 2019
Temperature / Humidity	22 deg. C / 42 % RH	23 deg. C / 45 % RH	22 deg. C / 44 % RH	22 deg. C / 44 % RH
Engineer	Takahiro Suzuki	Kazuya Noda	Kazuya Noda	Kazuya Noda
	(30 MHz – 1000 MHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11g 2412 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	34.470	QP	23.61	16.77	6.56	32.19	0.00	14.75	40.0	25.2	244	1	
Hori.	37.944	QP	24.00	15.44	6.63	32.19	0.00	13.88	40.0	26.1	139	218	
Hori.	155.278	QP	23.19	14.86	7.89	32.11	0.00	13.83	43.5	29.6	113	320	
Hori.	2390.000	PK	51.03	28.51	14.11	38.68	2.35	57.32	73.9	16.5	168	91	
Hori.	4824.000	PK	44.96	31.71	6.41	38.55	2.35	46.88	73.9	27.0	114	327	
Hori.	7236.000	PK	44.92	37.32	7.94	39.20	2.35	53.33	73.9	20.5	150	0	
Hori.	9648.000	PK	45.74	38.93	9.25	39.71	2.35	56.56	73.9	17.3	150	0	
Hori.	2390.000	AV	39.61	28.51	14.11	38.68	2.35	45.90	53.9	8.0	168	91	
Hori.	4824.000	AV	35.76	31.71	6.41	38.55	2.35	37.68	53.9	16.2	114	327	
Hori.	7236.000	AV	35.38	37.32	7.94	39.20	2.35	43.79	53.9	10.1	150	0	
Hori.	9648.000	AV	36.26	38.93	9.25	39.71	2.35	47.08	53.9	6.8	150	0	
Vert.	52.002	QP	25.16	10.37	6.79	32.19	0.00	10.13	40.0	29.8	100	3	
Vert.	54.920	QP	25.03	9.41	6.76	32.19	0.00	9.01	40.0	30.9	100	149	
Vert.	70.718	QP	26.72	6.34	6.86	32.17	0.00	7.75	40.0	32.2	100	172	
Vert.	134.273	QP	24.27	13.99	7.52	32.13	0.00	13.65	43.5	29.8	100	79	
Vert.	485.612	QP	24.96	17.15	9.58	31.95	0.00	19.74	46.0	26.2	100	125	
Vert.	2390.000	PK	50.07	28.51	14.11	38.68	2.35	56.36	73.9	17.5	170	175	
Vert.	4824.000	PK	45.28	31.71	6.41	38.55	2.35	47.20	73.9	26.7	158	13	
Vert.	7236.000	PK	44.61	37.32	7.94	39.20	2.35	53.02	73.9	20.8	150	0	
Vert.	9648.000	PK	45.66	38.93	9.25	39.71	2.35	56.48	73.9	17.4	150	0	
Vert.	2390.000	AV	39.20	28.51	14.11	38.68	2.35	45.49	53.9	8.4	170	175	
Vert.	4824.000	AV	35.50	31.71	6.41	38.55	2.35	37.42	53.9	16.4	158	13	
Vert.	7236.000	AV	35.38	37.32	7.94	39.20	2.35	43.79	53.9	10.1	150	0	
Vert.	9648.000	AV	36.42	38.93	9.25	39.71	2.35	47.24	53.9	**6.6**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

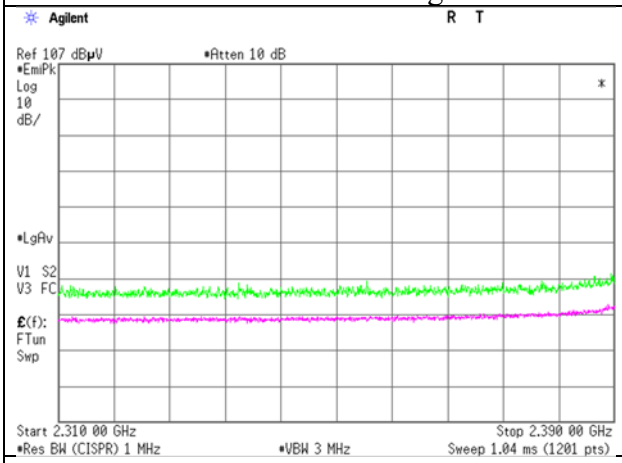
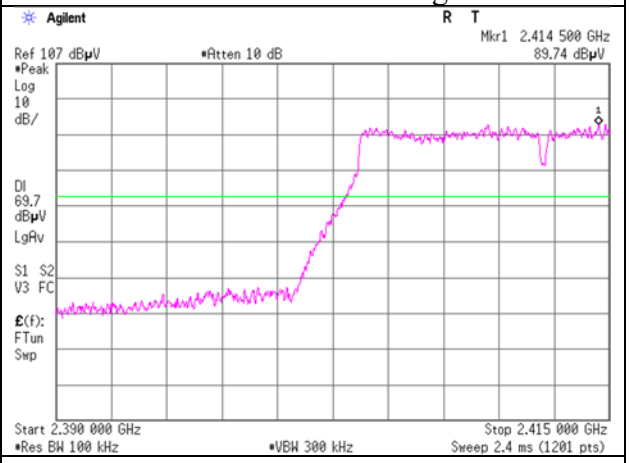
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

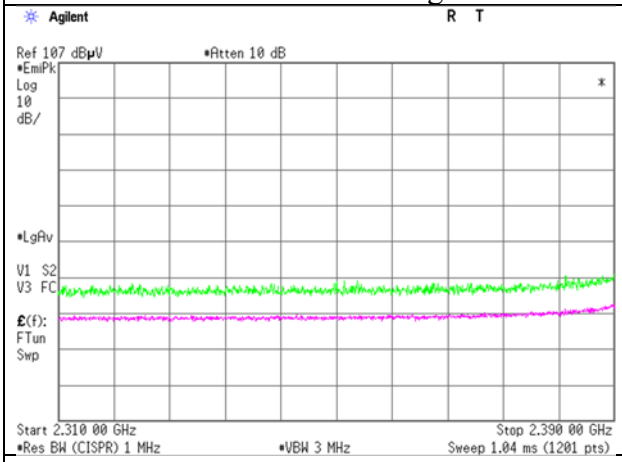
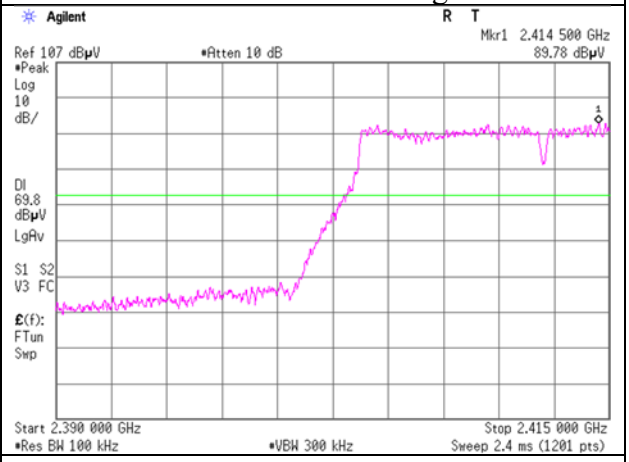
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	89.86	28.46	14.13	38.67	2.35	96.13	-	-	Carrier
Hori.	2400.000	PK	42.68	28.48	14.12	38.67	2.35	48.96	76.13	27.1	
Vert.	2412.000	PK	89.67	28.46	14.13	38.67	2.35	95.94	-	-	Carrier
Vert.	2400.000	PK	42.63	28.48	14.12	38.67	2.35	48.91	75.94	27.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	November 11, 2019
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Kazuya Noda
Mode	Tx 11g 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	November 12, 2019	November 13, 2019
Temperature / Humidity	23 deg. C / 45 % RH	22 deg. C / 44 % RH
Engineer	Kazuya Noda	Kazuya Noda
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11g 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	45.02	31.73	6.45	38.55	2.35	47.00	73.9	26.9	127	317	
Hori.	7311.000	PK	44.79	37.40	8.02	39.31	2.35	53.25	73.9	20.6	150	0	
Hori.	9748.000	PK	45.79	39.32	9.26	39.64	2.35	57.08	73.9	16.8	150	0	
Hori.	4874.000	AV	35.66	31.73	6.45	38.55	2.35	37.64	53.9	16.2	127	317	
Hori.	7311.000	AV	35.69	37.40	8.02	39.31	2.35	44.15	53.9	9.7	150	0	
Hori.	9748.000	AV	35.91	39.32	9.26	39.64	2.35	47.20	53.9	**6.7**	150	0	
Vert.	4874.000	PK	44.61	31.73	6.45	38.55	2.35	46.59	73.9	27.3	136	156	
Vert.	7311.000	PK	45.04	37.40	8.02	39.31	2.35	53.50	73.9	20.4	150	0	
Vert.	9748.000	PK	45.82	39.32	9.26	39.64	2.35	57.11	73.9	16.7	150	0	
Vert.	4874.000	AV	35.63	31.73	6.45	38.55	2.35	37.61	53.9	16.2	136	156	
Vert.	7311.000	AV	35.46	37.40	8.02	39.31	2.35	43.92	53.9	9.9	150	0	
Vert.	9748.000	AV	35.72	39.32	9.26	39.64	2.35	47.01	53.9	6.8	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13024969S-AC-R3		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	November 11, 2019	November 12, 2019	November 13, 2019
Temperature / Humidity	22 deg. C / 41 % RH	23 deg. C / 45 % RH	22 deg. C / 44 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda
	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11g 2462 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.63	28.35	14.19	38.62	2.35	55.90	73.9	18.0	150	91	
Hori.	4924.000	PK	45.92	31.85	6.48	38.55	2.35	48.05	73.9	25.8	147	283	
Hori.	7386.000	PK	44.96	37.51	8.08	39.43	2.35	53.47	73.9	20.4	150	0	
Hori.	9848.000	PK	45.52	39.50	9.26	39.56	2.35	57.07	73.9	16.8	150	0	
Hori.	2483.500	AV	38.05	28.35	14.19	38.62	2.35	44.32	53.9	9.5	150	91	
Hori.	4924.000	AV	35.93	31.85	6.48	38.55	2.35	38.06	53.9	15.8	147	283	
Hori.	7386.000	AV	36.00	37.51	8.08	39.43	2.35	44.51	53.9	9.3	150	0	
Hori.	9848.000	AV	35.68	39.50	9.26	39.56	2.35	47.23	53.9	**6.6**	150	0	
Vert.	2483.500	PK	50.24	28.35	14.19	38.62	2.35	56.51	73.9	17.3	146	171	
Vert.	4924.000	PK	45.17	31.85	6.48	38.55	2.35	47.30	73.9	26.6	151	17	
Vert.	7386.000	PK	45.31	37.51	8.08	39.43	2.35	53.82	73.9	20.0	150	0	
Vert.	9848.000	PK	45.35	39.50	9.26	39.56	2.35	56.90	73.9	17.0	150	0	
Vert.	2483.500	AV	39.85	28.35	14.19	38.62	2.35	46.12	53.9	7.7	146	171	
Vert.	4924.000	AV	35.61	31.85	6.48	38.55	2.35	37.74	53.9	16.1	151	17	
Vert.	7386.000	AV	35.93	37.51	8.08	39.43	2.35	44.44	53.9	9.4	150	0	
Vert.	9848.000	AV	35.71	39.50	9.26	39.56	2.35	47.26	53.9	**6.6**	150	0	

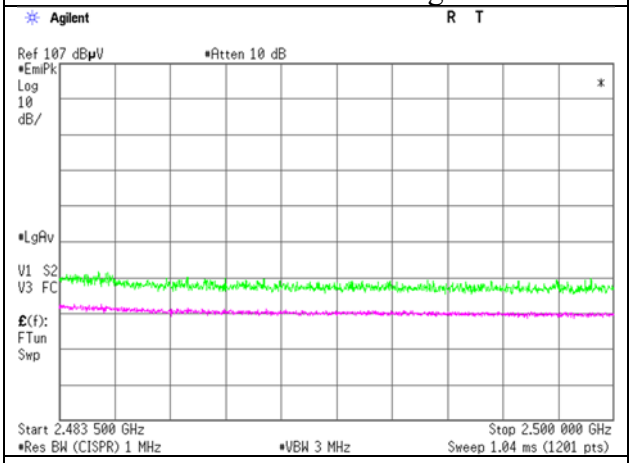
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	November 11, 2019
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Kazuya Noda
Mode	Tx 11g 2462 MHz

Horizontal

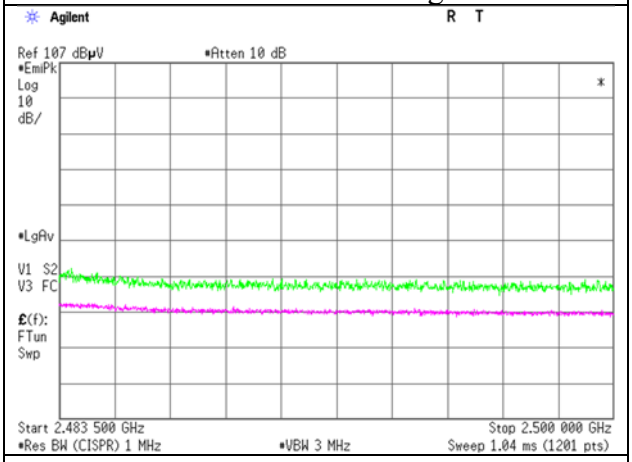
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	November 11, 2019	November 12, 2019	November 13, 2019
Temperature / Humidity	22 deg. C / 41 % RH	23 deg. C / 45 % RH	22 deg. C / 44 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda
	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11n-20 2412 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	48.58	28.51	14.11	38.68	2.35	54.87	73.9	19.0	190	88	
Hori.	4824.000	PK	45.48	31.71	6.41	38.55	2.35	47.40	73.9	26.5	138	329	
Hori.	7236.000	PK	44.80	37.32	7.94	39.20	2.35	53.21	73.9	20.6	150	0	
Hori.	9648.000	PK	45.39	38.93	9.25	39.71	2.35	56.21	73.9	17.6	150	0	
Hori.	2390.000	AV	38.89	28.51	14.11	38.68	2.35	45.18	53.9	8.7	190	88	
Hori.	4824.000	AV	35.37	31.71	6.41	38.55	2.35	37.29	53.9	16.6	138	329	
Hori.	7236.000	AV	35.29	37.32	7.94	39.20	2.35	43.70	53.9	10.2	150	0	
Hori.	9648.000	AV	36.65	38.93	9.25	39.71	2.35	47.47	53.9	**6.4**	150	0	
Vert.	2390.000	PK	49.55	28.51	14.11	38.68	2.35	55.84	73.9	18.0	191	174	
Vert.	4824.000	PK	45.17	31.71	6.41	38.55	2.35	47.09	73.9	26.8	157	24	
Vert.	7236.000	PK	45.16	37.32	7.94	39.20	2.35	53.57	73.9	20.3	150	0	
Vert.	9648.000	PK	45.76	38.93	9.25	39.71	2.35	56.58	73.9	17.3	150	0	
Vert.	2390.000	AV	38.29	28.51	14.11	38.68	2.35	44.58	53.9	9.3	191	174	
Vert.	4824.000	AV	35.49	31.71	6.41	38.55	2.35	37.41	53.9	16.5	157	24	
Vert.	7236.000	AV	35.29	37.32	7.94	39.20	2.35	43.70	53.9	10.2	150	0	
Vert.	9648.000	AV	36.28	38.93	9.25	39.71	2.35	47.10	53.9	6.8	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

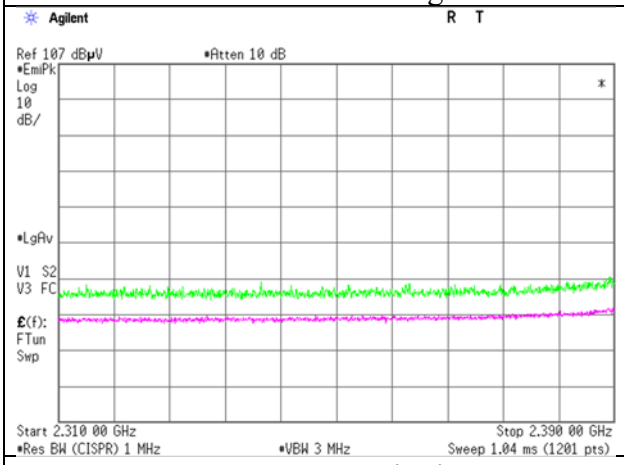
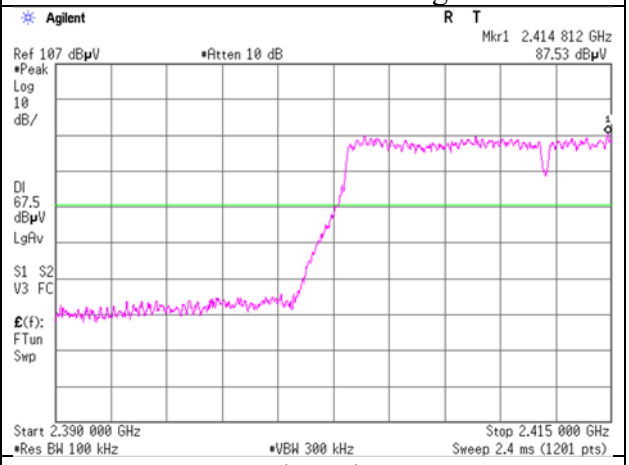
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

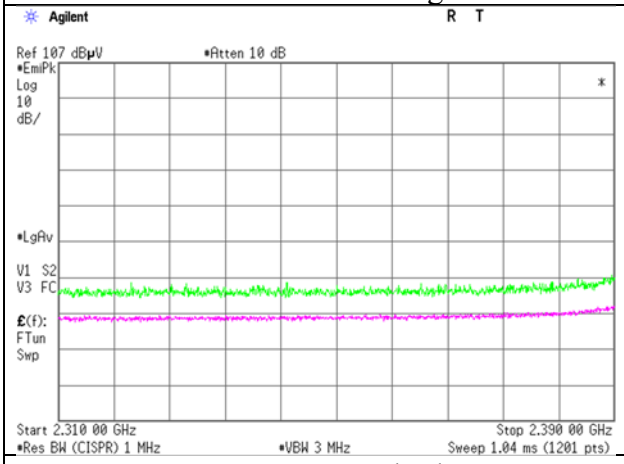
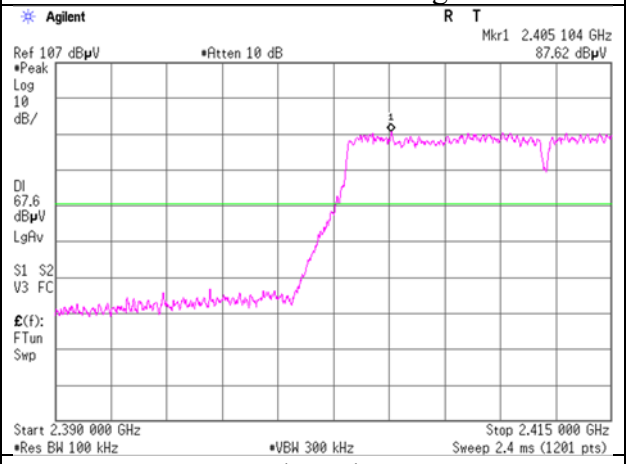
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	86.86	28.46	14.13	38.67	2.35	93.13	-	-	Carrier
Hori.	2400.000	PK	41.98	28.48	14.12	38.67	2.35	48.26	73.13	24.8	
Vert.	2412.000	PK	87.64	28.46	14.13	38.67	2.35	93.91	-	-	Carrier
Vert.	2400.000	PK	42.60	28.48	14.12	38.67	2.35	48.88	73.91	25.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	November 11, 2019
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Kazuya Noda
Mode	Tx 11n-20 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	November 12, 2019	November 13, 2019
Temperature / Humidity	23 deg. C / 45 % RH	22 deg. C / 44 % RH
Engineer	Kazuya Noda	Kazuya Noda
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11n-20 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	45.72	31.73	6.45	38.55	2.35	47.70	73.9	26.2	115	329	
Hori.	7311.000	PK	45.45	37.40	8.02	39.31	2.35	53.91	73.9	19.9	150	0	
Hori.	9748.000	PK	45.52	39.32	9.26	39.64	2.35	56.81	73.9	17.0	150	0	
Hori.	4874.000	AV	36.00	31.73	6.45	38.55	2.35	37.98	53.9	15.9	115	329	
Hori.	7311.000	AV	35.45	37.40	8.02	39.31	2.35	43.91	53.9	9.9	150	0	
Hori.	9748.000	AV	35.68	39.32	9.26	39.64	2.35	46.97	53.9	**6.9**	150	0	
Vert.	4874.000	PK	45.84	31.73	6.45	38.55	2.35	47.82	73.9	26.0	109	349	
Vert.	7311.000	PK	44.72	37.40	8.02	39.31	2.35	53.18	73.9	20.7	150	0	
Vert.	9748.000	PK	45.17	39.32	9.26	39.64	2.35	56.46	73.9	17.4	150	0	
Vert.	4874.000	AV	36.03	31.73	6.45	38.55	2.35	38.01	53.9	15.8	109	349	
Vert.	7311.000	AV	35.53	37.40	8.02	39.31	2.35	43.99	53.9	9.9	150	0	
Vert.	9748.000	AV	35.53	39.32	9.26	39.64	2.35	46.82	53.9	7.0	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13024969S-AC-R3		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	November 11, 2019	November 12, 2019	November 13, 2019
Temperature / Humidity	22 deg. C / 41 % RH	23 deg. C / 45 % RH	22 deg. C / 44 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda
	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11n-20 2462 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	48.58	28.35	14.19	38.62	2.35	54.85	73.9	19.0	170	81	
Hori.	4924.000	PK	45.25	31.85	6.48	38.55	2.35	47.38	73.9	26.5	127	332	
Hori.	7386.000	PK	45.12	37.51	8.08	39.43	2.35	53.63	73.9	20.2	150	0	
Hori.	9848.000	PK	45.43	39.50	9.26	39.56	2.35	56.98	73.9	16.9	150	0	
Hori.	2483.500	AV	39.11	28.35	14.19	38.62	2.35	45.38	53.9	8.5	170	81	
Hori.	4924.000	AV	36.17	31.85	6.48	38.55	2.35	38.30	53.9	15.6	127	332	
Hori.	7386.000	AV	35.59	37.51	8.08	39.43	2.35	44.10	53.9	9.8	150	0	
Hori.	9848.000	AV	35.79	39.50	9.26	39.56	2.35	47.34	53.9	**6.5**	150	0	
Vert.	2483.500	PK	47.82	28.35	14.19	38.62	2.35	54.09	73.9	19.8	147	165	
Vert.	4924.000	PK	44.10	31.85	6.48	38.55	2.35	46.23	73.9	27.6	117	17	
Vert.	7386.000	PK	44.69	37.51	8.08	39.43	2.35	53.20	73.9	20.7	150	0	
Vert.	9848.000	PK	44.39	39.50	9.26	39.56	2.35	55.94	73.9	17.9	150	0	
Vert.	2483.500	AV	38.94	28.35	14.19	38.62	2.35	45.21	53.9	8.6	147	165	
Vert.	4924.000	AV	35.65	31.85	6.48	38.55	2.35	37.78	53.9	16.1	117	17	
Vert.	7386.000	AV	35.89	37.51	8.08	39.43	2.35	44.40	53.9	9.5	150	0	
Vert.	9848.000	AV	35.30	39.50	9.26	39.56	2.35	46.85	53.9	7.0	150	0	

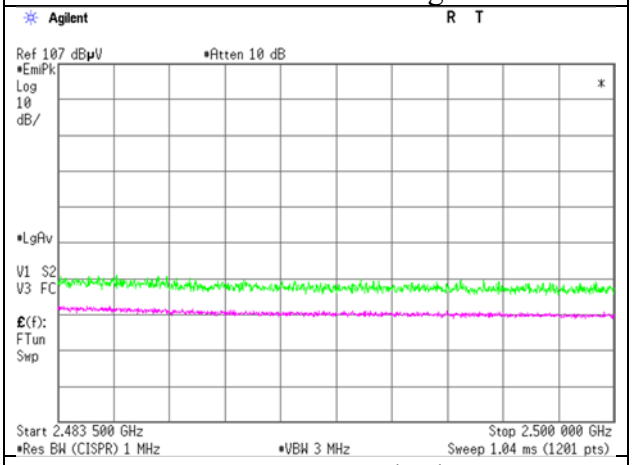
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	November 11, 2019
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Kazuya Noda
Mode	Tx 11n-20 2462 MHz

Horizontal

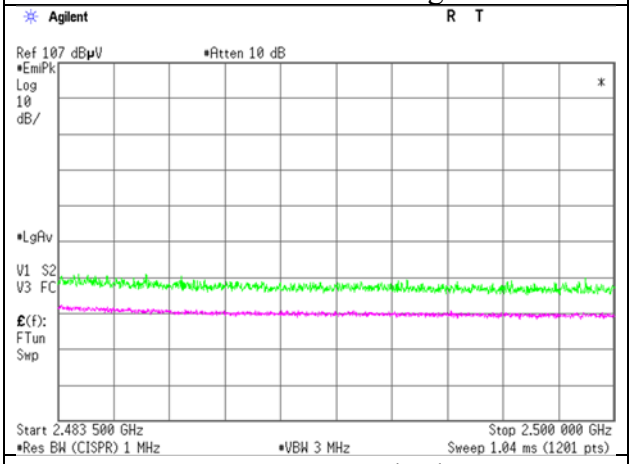
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	November 11, 2019	November 12, 2019	November 13, 2019
Temperature / Humidity	22 deg. C / 41 % RH	23 deg. C / 45 % RH	22 deg. C / 44 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda
	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11n-40 2422 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	50.21	28.51	14.11	38.68	2.35	56.50	73.9	17.4	148	84	
Hori.	4844.000	PK	45.16	31.72	6.43	38.55	2.35	47.11	73.9	26.7	119	332	
Hori.	7266.000	PK	45.02	37.35	7.99	39.24	2.35	53.47	73.9	20.4	150	0	
Hori.	9688.000	PK	45.06	39.05	9.26	39.68	2.35	56.04	73.9	17.8	150	0	
Hori.	2390.000	AV	41.28	28.51	14.11	38.68	2.35	47.57	53.9	**6.3**	148	84	
Hori.	4844.000	AV	35.34	31.72	6.43	38.55	2.35	37.29	53.9	16.6	119	332	
Hori.	7266.000	AV	35.55	37.35	7.99	39.24	2.35	44.00	53.9	9.9	150	0	
Hori.	9688.000	AV	36.12	39.05	9.26	39.68	2.35	47.10	53.9	6.8	150	0	
Vert.	2390.000	PK	49.73	28.51	14.11	38.68	2.35	56.02	73.9	17.8	156	183	
Vert.	4844.000	PK	45.05	31.72	6.43	38.55	2.35	47.00	73.9	26.9	163	4	
Vert.	7266.000	PK	44.85	37.35	7.99	39.24	2.35	53.30	73.9	20.6	150	0	
Vert.	9688.000	PK	45.50	39.05	9.26	39.68	2.35	56.48	73.9	17.4	150	0	
Vert.	2390.000	AV	40.62	28.51	14.11	38.68	2.35	46.91	53.9	6.9	156	183	
Vert.	4844.000	AV	35.00	31.72	6.43	38.55	2.35	36.95	53.9	16.9	163	4	
Vert.	7266.000	AV	35.54	37.35	7.99	39.24	2.35	43.99	53.9	9.9	150	0	
Vert.	9688.000	AV	36.27	39.05	9.26	39.68	2.35	47.25	53.9	6.6	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

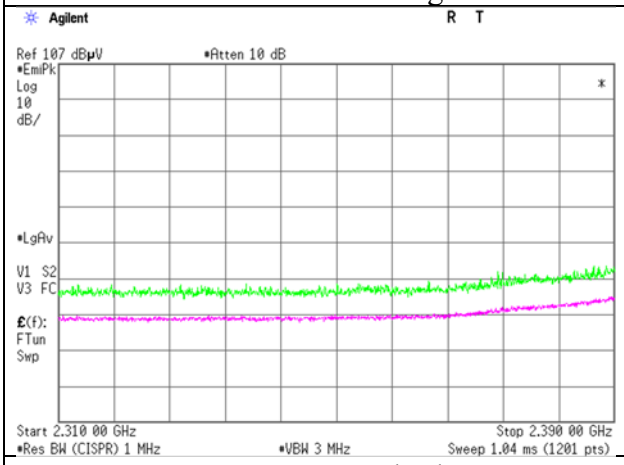
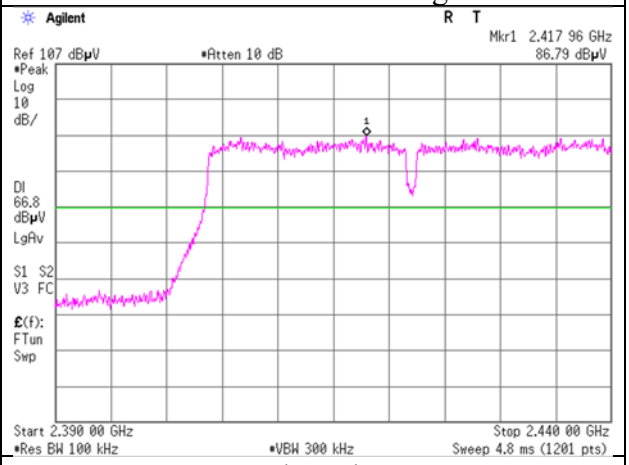
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2422.000	PK	86.20	28.44	14.15	38.66	2.35	92.48	-	-	Carrier
Hori.	2400.000	PK	44.96	28.48	14.12	38.67	2.35	51.24	72.48	21.2	
Vert.	2422.000	PK	85.62	28.44	14.15	38.66	2.35	91.90	-	-	Carrier
Vert.	2400.000	PK	44.28	28.48	14.12	38.67	2.35	50.56	71.90	21.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

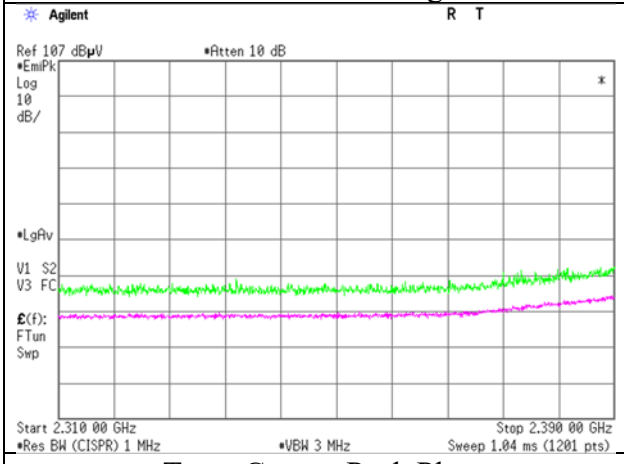
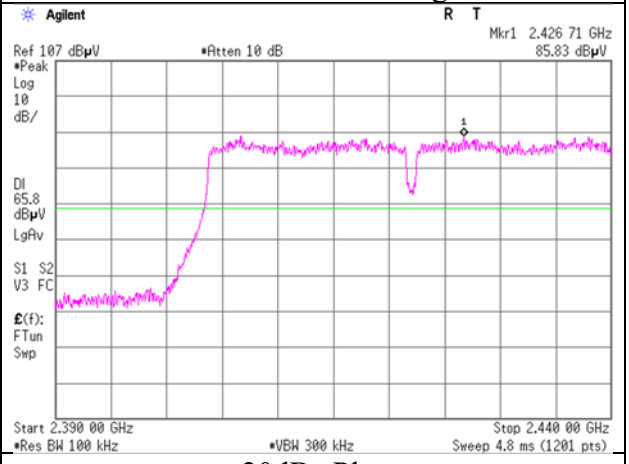
Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	November 11, 2019
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Kazuya Noda
Mode	Tx 11n-40 2422 MHz

Horizontal

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	No.2	No.2
Date	November 12, 2019	November 13, 2019
Temperature / Humidity	23 deg. C / 45 % RH	22 deg. C / 44 % RH
Engineer	Kazuya Noda	Kazuya Noda
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11n-40 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	44.29	31.73	6.45	38.55	2.35	46.27	73.9	27.6	137	321	
Hori.	7311.000	PK	45.14	37.40	8.02	39.31	2.35	53.60	73.9	20.3	150	0	
Hori.	9748.000	PK	45.00	39.32	9.26	39.64	2.35	56.29	73.9	17.6	150	0	
Hori.	4874.000	AV	35.32	31.73	6.45	38.55	2.35	37.30	53.9	16.6	137	321	
Hori.	7311.000	AV	35.67	37.40	8.02	39.31	2.35	44.13	53.9	9.7	150	0	
Hori.	9748.000	AV	36.26	39.32	9.26	39.64	2.35	47.55	53.9	**6.3**	150	0	
Vert.	4874.000	PK	44.83	31.73	6.45	38.55	2.35	46.81	73.9	27.0	126	355	
Vert.	7311.000	PK	45.40	37.40	8.02	39.31	2.35	53.86	73.9	20.0	150	0	
Vert.	9748.000	PK	45.21	39.32	9.26	39.64	2.35	56.50	73.9	17.4	150	0	
Vert.	4874.000	AV	35.34	31.73	6.45	38.55	2.35	37.32	53.9	16.5	126	355	
Vert.	7311.000	AV	35.56	37.40	8.02	39.31	2.35	44.02	53.9	9.8	150	0	
Vert.	9748.000	AV	36.05	39.32	9.26	39.64	2.35	47.34	53.9	6.5	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13024969S-AC-R3		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	No.2	No.2	No.2
Date	November 11, 2019	November 12, 2019	November 13, 2019
Temperature / Humidity	22 deg. C / 41 % RH	23 deg. C / 45 % RH	22 deg. C / 44 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda
	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11n-40 2452 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.13	28.35	14.19	38.62	2.35	55.40	73.9	18.5	166	95	
Hori.	4904.000	PK	44.86	31.79	6.46	38.55	2.35	46.91	73.9	26.9	154	306	
Hori.	7356.000	PK	45.43	37.45	8.06	39.38	2.35	53.91	73.9	19.9	150	0	
Hori.	9808.000	PK	45.36	39.45	9.26	39.59	2.35	56.83	73.9	17.0	150	0	
Hori.	2483.500	AV	39.69	28.35	14.19	38.62	2.35	45.96	53.9	7.9	166	95	
Hori.	4904.000	AV	35.38	31.79	6.46	38.55	2.35	37.43	53.9	16.4	154	306	
Hori.	7356.000	AV	35.48	37.45	8.06	39.38	2.35	43.96	53.9	9.9	150	0	
Hori.	9808.000	AV	36.08	39.45	9.26	39.59	2.35	47.55	53.9	**6.3**	150	0	
Vert.	2483.500	PK	49.97	28.35	14.19	38.62	2.35	56.24	73.9	17.6	173	184	
Vert.	4904.000	PK	45.20	31.79	6.46	38.55	2.35	47.25	73.9	26.6	190	349	
Vert.	7356.000	PK	44.70	37.45	8.06	39.38	2.35	53.18	73.9	20.7	150	0	
Vert.	9808.000	PK	45.44	39.45	9.26	39.59	2.35	56.91	73.9	16.9	150	0	
Vert.	2483.500	AV	39.17	28.35	14.19	38.62	2.35	45.44	53.9	8.4	173	184	
Vert.	4904.000	AV	35.08	31.79	6.46	38.55	2.35	37.13	53.9	16.7	190	349	
Vert.	7356.000	AV	35.37	37.45	8.06	39.38	2.35	43.85	53.9	10.0	150	0	
Vert.	9808.000	AV	35.98	39.45	9.26	39.59	2.35	47.45	53.9	6.4	150	0	

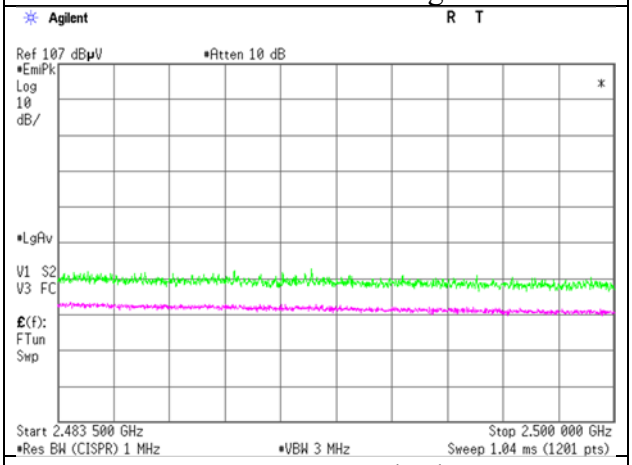
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.2
Date	November 11, 2019
Temperature / Humidity	22 deg. C / 41 % RH
Engineer	Kazuya Noda
Mode	Tx 11n-40 2452 MHz

Horizontal

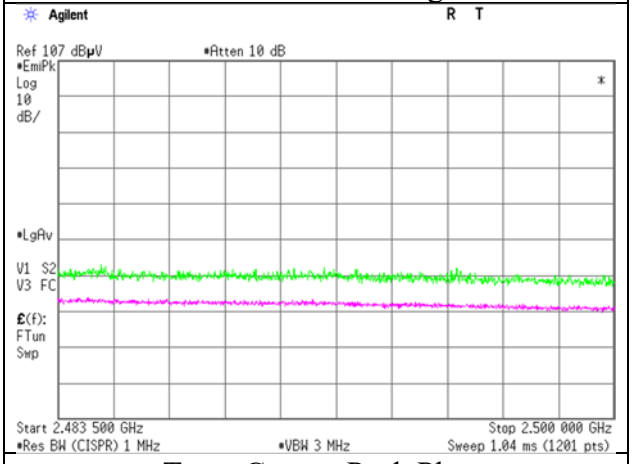
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

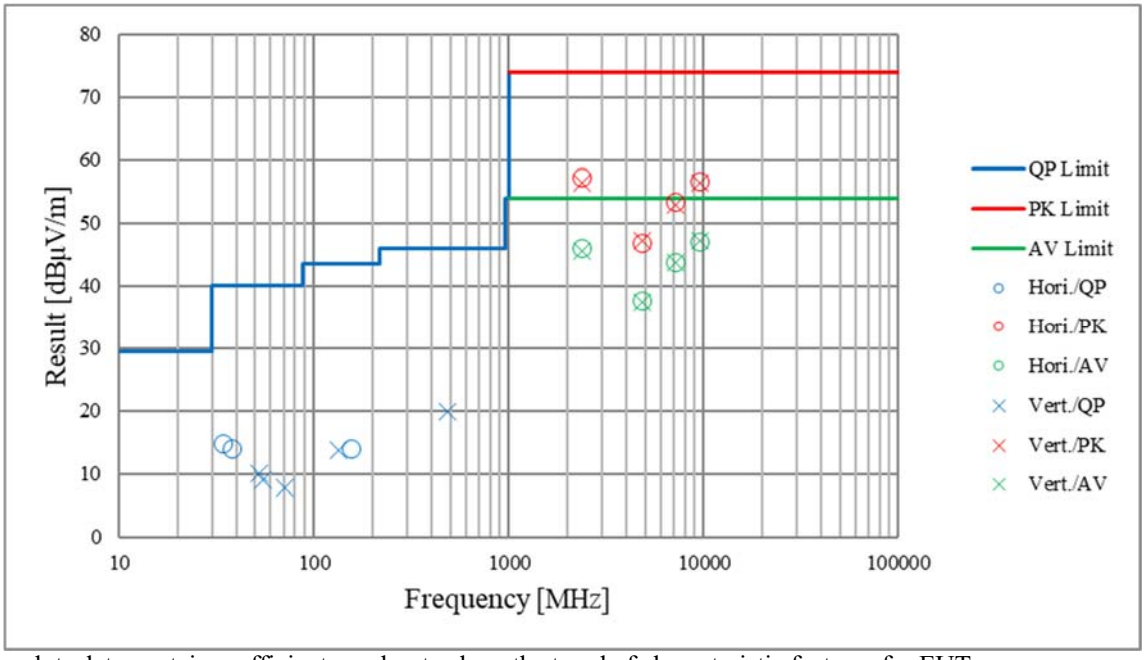


Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13024969S-AC-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.2	No.2	No.2
Date	December 12, 2019	November 12, 2019	November 13, 2019	November 13, 2019
Temperature / Humidity	22 deg. C / 42 % RH	23 deg. C / 45 % RH	22 deg. C / 44 % RH	22 deg. C / 44 % RH
Engineer	Takahiro Suzuki	Kazuya Noda	Kazuya Noda	Kazuya Noda
	(30 MHz – 1000 MHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx 11g 2412 MHz			



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission

Report No.	13024969S-AC-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	December 12, 2019	November 22, 2019	November 26, 2019	November 25, 2019
Temperature / Humidity	22 deg. C / 45 % RH	22 deg. C / 39 % RH	23 deg. C / 44 % RH	23 deg. C / 55 % RH
Engineer	Toshinori Yamada	Takahiro Suzuki	Yasumasa Owaki	Yasumasa Owaki
	(30 MHz – 1000 MHz)	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx BT LE 1 M-PHY 2402 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	30.148	QP	22.40	18.22	6.47	32.19	0.00	14.90	40.0	25.1	300	0	
Hori.	33.677	QP	21.50	17.07	6.54	32.19	0.00	12.92	40.0	27.0	300	0	
Hori.	871.193	QP	20.90	21.57	10.93	31.25	0.00	22.15	46.0	23.8	100	0	
Hori.	947.697	QP	20.20	21.56	11.16	30.66	0.00	22.26	46.0	23.7	150	0	
Hori.	2336.685	PK	52.22	28.44	14.05	41.57	2.35	55.49	73.9	18.4	126	77	
Hori.	2390.000	PK	47.16	28.33	14.10	41.59	2.35	50.35	73.9	23.5	138	86	
Hori.	4804.000	PK	48.13	31.62	6.44	42.88	2.35	45.66	73.9	28.2	168	96	
Hori.	7206.000	PK	49.18	37.23	7.87	42.92	2.35	53.71	73.9	20.1	150	0	Floor Noise
Hori.	9608.000	PK	49.08	38.84	9.16	43.17	2.35	56.26	73.9	17.6	150	0	Floor Noise
Hori.	7206.000	AV	39.71	37.23	7.87	42.92	2.35	44.24	53.9	9.6	150	0	Floor Noise
Hori.	9608.000	AV	39.93	38.84	9.16	43.17	2.35	47.11	53.9	**6.7**	150	0	Floor Noise
Vert.	30.871	QP	22.50	17.97	6.49	32.19	0.00	14.77	40.0	25.2	100	0	
Vert.	51.996	QP	23.70	10.37	6.79	32.19	0.00	8.67	40.0	31.3	100	176	
Vert.	190.781	QP	21.50	16.24	7.88	32.08	0.00	13.54	43.5	29.9	100	0	
Vert.	918.818	QP	20.50	21.65	11.07	30.92	0.00	22.30	46.0	23.7	100	0	
Vert.	2336.641	PK	51.00	28.44	14.05	41.57	2.35	54.27	73.9	19.6	207	146	
Vert.	2390.000	PK	46.97	28.33	14.10	41.59	2.35	50.16	73.9	23.7	244	160	
Vert.	4804.000	PK	48.21	31.62	6.44	42.88	2.35	45.74	73.9	28.1	280	200	
Vert.	7206.000	PK	48.45	37.23	7.87	42.92	2.35	52.98	73.9	20.9	150	0	Floor Noise
Vert.	9608.000	PK	48.75	38.84	9.16	43.17	2.35	55.93	73.9	17.9	150	0	Floor Noise
Vert.	7206.000	AV	39.87	37.23	7.87	42.92	2.35	44.40	53.9	9.5	150	0	Floor Noise
Vert.	9608.000	AV	40.01	38.84	9.16	43.17	2.35	47.19	53.9	**6.7**	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2336.685	AV	41.14	28.44	14.05	41.57	3.92	2.35	48.33	53.9	**5.5**	
Hori.	2390.000	AV	38.55	28.33	14.10	41.59	3.92	2.35	45.66	53.9	8.2	*1)
Hori.	4804.000	AV	39.37	31.62	6.44	42.88	3.92	2.35	40.82	53.9	13.0	
Vert.	2336.641	AV	40.69	28.44	14.05	41.57	3.92	2.35	47.88	53.9	6.0	
Vert.	2390.000	AV	37.54	28.33	14.10	41.59	3.92	2.35	44.65	53.9	9.2	*1)
Vert.	4804.000	AV	39.24	31.62	6.44	42.88	3.92	2.35	40.69	53.9	13.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

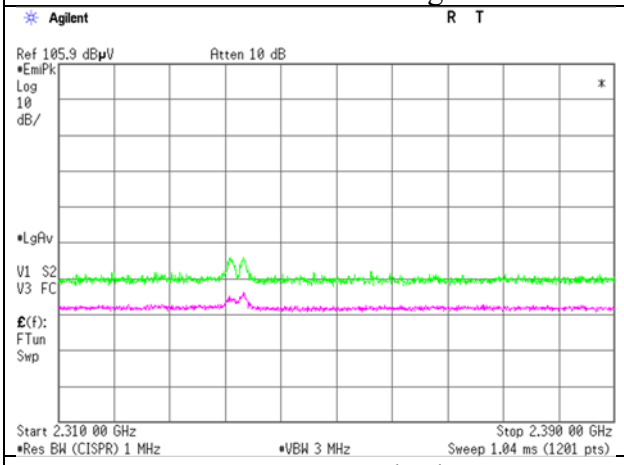
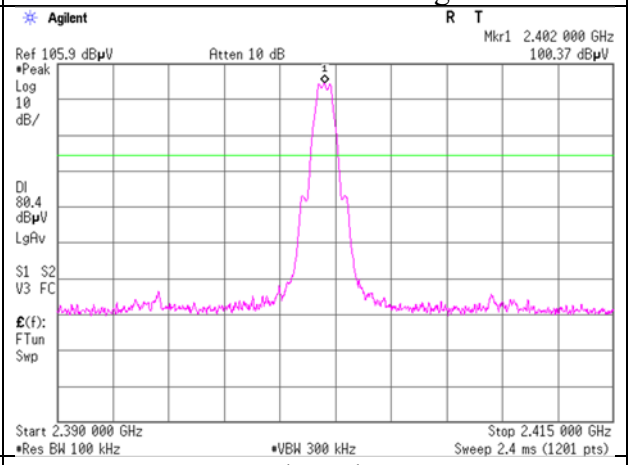
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

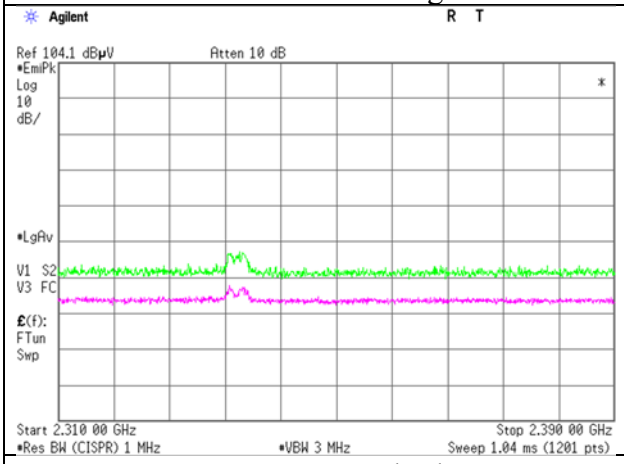
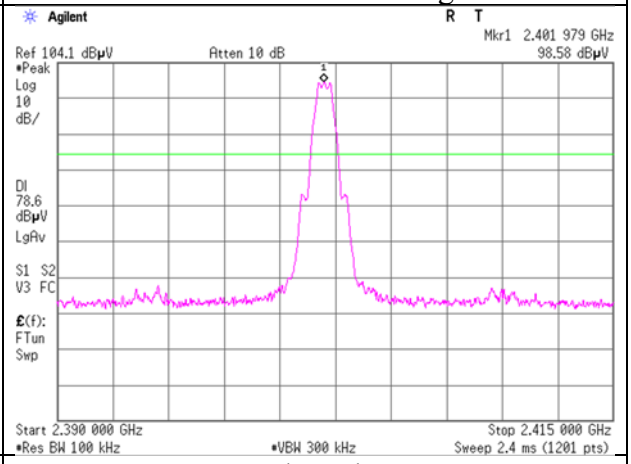
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	99.89	28.31	14.11	41.60	2.35	103.06	-	-	Carrier
Hori.	2400.000	PK	42.28	28.31	14.10	41.60	2.35	45.44	83.06	37.6	
Vert.	2402.000	PK	98.36	28.31	14.11	41.60	2.35	101.53	-	-	Carrier
Vert.	2400.000	PK	41.56	28.31	14.10	41.60	2.35	44.72	81.53	36.8	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 22, 2019
Temperature / Humidity	22 deg. C / 39 % RH
Engineer	Takahiro Suzuki
Mode	Tx BT LE 1 M-PHY 2402 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized- band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	December 12, 2019	November 22, 2019	November 26, 2019	November 25, 2019
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 39 % RH	23 deg. C / 44 % RH	23 deg. C / 55 % RH
Engineer	Takahiro Suzuki	Takahiro Suzuki	Yasumasa Owaki	Yasumasa Owaki
	(30 MHz – 1000 MHz)	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx BT LE 1 M-PHY 2440 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	34.938	QP	23.78	16.59	6.57	32.19	0.00	14.75	40.0	25.2	256	343	
Hori.	36.867	QP	23.91	15.89	6.60	32.19	0.00	14.21	40.0	25.7	200	218	
Hori.	120.548	QP	24.00	12.97	7.29	32.14	0.00	12.12	43.5	31.3	150	0	
Hori.	2371.155	PK	51.84	28.39	14.07	41.59	2.35	55.06	73.9	18.8	129	78	
Hori.	2508.388	PK	51.45	28.21	14.20	41.63	2.35	54.58	73.9	19.3	163	74	
Hori.	4880.000	PK	48.55	31.71	6.49	42.89	2.35	46.21	73.9	27.6	163	102	
Hori.	7320.000	PK	48.19	37.38	7.95	43.15	2.35	52.72	73.9	21.1	150	0	Floor Noise
Hori.	9760.000	PK	48.00	39.33	9.21	43.01	2.35	55.88	73.9	18.0	150	0	Floor Noise
Hori.	7320.000	AV	38.99	37.38	7.95	43.15	2.35	43.52	53.9	10.3	150	0	Floor Noise
Hori.	9760.000	AV	38.65	39.33	9.21	43.01	2.35	46.53	53.9	7.3	150	0	Floor Noise
Vert.	50.470	QP	23.68	10.89	6.80	32.19	0.00	9.18	40.0	30.8	100	194	
Vert.	52.646	QP	24.66	10.16	6.79	32.19	0.00	9.42	40.0	30.5	100	178	
Vert.	71.908	QP	25.97	6.27	6.96	32.17	0.00	7.03	40.0	32.9	100	349	
Vert.	98.310	QP	28.04	9.76	7.42	32.15	0.00	13.07	43.5	30.4	100	358	
Vert.	719.871	QP	26.76	19.75	10.44	31.83	0.00	25.12	46.0	20.8	100	359	
Vert.	2371.122	PK	51.93	28.39	14.07	41.59	2.35	55.15	73.9	18.7	204	159	
Vert.	2508.433	PK	52.00	28.21	14.20	41.63	2.35	55.13	73.9	18.7	248	176	
Vert.	4880.000	PK	48.15	31.71	6.49	42.89	2.35	45.81	73.9	28.0	282	113	
Vert.	7320.000	PK	48.01	37.38	7.95	43.15	2.35	52.54	73.9	21.3	150	0	Floor Noise
Vert.	9760.000	PK	47.83	39.33	9.21	43.01	2.35	55.71	73.9	18.1	150	0	Floor Noise
Vert.	7320.000	AV	39.17	37.38	7.95	43.15	2.35	43.70	53.9	10.2	150	0	Floor Noise
Vert.	9760.000	AV	38.88	39.33	9.21	43.01	2.35	46.76	53.9	**7.1**	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2371.155	AV	41.69	28.39	14.07	41.59	3.92	2.35	48.83	53.9	**5.0**	
Hori.	2508.388	AV	40.77	28.21	14.20	41.63	3.92	2.35	47.82	53.9	6.0	
Hori.	4880.000	AV	39.51	31.71	6.49	42.89	3.92	2.35	41.09	53.9	12.8	
Vert.	2371.122	AV	41.26	28.39	14.07	41.59	3.92	2.35	48.40	53.9	5.5	
Vert.	2508.433	AV	41.33	28.21	14.20	41.63	3.92	2.35	48.38	53.9	5.5	
Vert.	4880.000	AV	39.40	31.71	6.49	42.89	3.92	2.35	40.98	53.9	12.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission

Report No.	13024969S-AC-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	December 12, 2019	November 22, 2019	November 26, 2019	November 25, 2019
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 39 % RH	23 deg. C / 44 % RH	23 deg. C / 55 % RH
Engineer	Takahiro Suzuki	Takahiro Suzuki	Yasumasa Owaki	Yasumasa Owaki
	(30 MHz – 1000 MHz)	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx BT LE 1 M-PHY 2480 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	34.935	QP	23.25	16.59	6.57	32.19	0.00	14.22	40.0	25.7	238	68	
Hori.	36.928	QP	24.00	15.87	6.60	32.19	0.00	14.28	40.0	25.7	144	227	
Hori.	120.413	QP	23.76	12.96	7.29	32.14	0.00	11.87	43.5	31.6	129	212	
Hori.	2483.500	PK	52.65	28.24	14.18	41.62	2.35	55.80	73.9	18.1	146	77	
Hori.	2554.983	PK	51.22	28.22	14.23	41.65	2.35	54.37	73.9	19.5	148	76	
Hori.	4960.000	PK	49.18	31.96	6.54	42.91	2.35	47.12	73.9	26.7	156	51	
Hori.	7440.000	PK	47.94	37.56	8.04	43.38	2.35	52.51	73.9	21.3	150	0	Floor Noise
Hori.	9920.000	PK	47.54	39.18	9.27	42.84	2.35	55.50	73.9	18.4	150	0	Floor Noise
Hori.	7440.000	AV	38.92	37.56	8.04	43.38	2.35	43.49	53.9	10.4	150	0	Floor Noise
Hori.	9920.000	AV	38.01	39.18	9.27	42.84	2.35	45.97	53.9	**7.9**	150	0	Floor Noise
Vert.	50.196	QP	23.55	10.97	6.81	32.19	0.00	9.14	40.0	30.8	100	319	
Vert.	52.122	QP	24.59	10.33	6.79	32.19	0.00	9.52	40.0	30.4	100	272	
Vert.	71.767	QP	26.18	6.28	6.95	32.17	0.00	7.24	40.0	32.7	100	107	
Vert.	98.361	QP	27.59	9.77	7.42	32.15	0.00	12.63	43.5	30.8	100	356	
Vert.	720.406	QP	26.82	19.76	10.44	31.83	0.00	25.19	46.0	20.8	100	210	
Vert.	2483.500	PK	51.45	28.24	14.18	41.62	2.35	54.60	73.9	19.3	209	173	
Vert.	2555.024	PK	51.94	28.22	14.23	41.65	2.35	55.09	73.9	18.8	260	186	
Vert.	4960.000	PK	48.23	31.96	6.54	42.91	2.35	46.17	73.9	27.7	283	139	
Vert.	7440.000	PK	48.36	37.56	8.04	43.38	2.35	52.93	73.9	20.9	150	0	Floor Noise
Vert.	9920.000	PK	47.45	39.18	9.27	42.84	2.35	55.41	73.9	18.4	150	0	Floor Noise
Vert.	7440.000	AV	38.92	37.56	8.04	43.38	2.35	43.49	53.9	10.4	150	0	Floor Noise
Vert.	9920.000	AV	37.98	39.18	9.27	42.84	2.35	45.94	53.9	**7.9**	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.63	28.24	14.18	41.62	3.92	2.35	45.70	53.9	8.2	*1)
Hori.	2554.983	AV	40.29	28.22	14.23	41.65	3.92	2.35	47.36	53.9	6.5	
Hori.	4960.000	AV	39.78	31.96	6.54	42.91	3.92	2.35	41.64	53.9	12.2	
Vert.	2483.500	AV	39.12	28.24	14.18	41.62	3.92	2.35	46.19	53.9	7.7	*1)
Vert.	2555.024	AV	40.43	28.22	14.23	41.65	3.92	2.35	47.50	53.9	**6.4**	
Vert.	4960.000	AV	39.39	31.96	6.54	42.91	3.92	2.35	41.25	53.9	12.6	

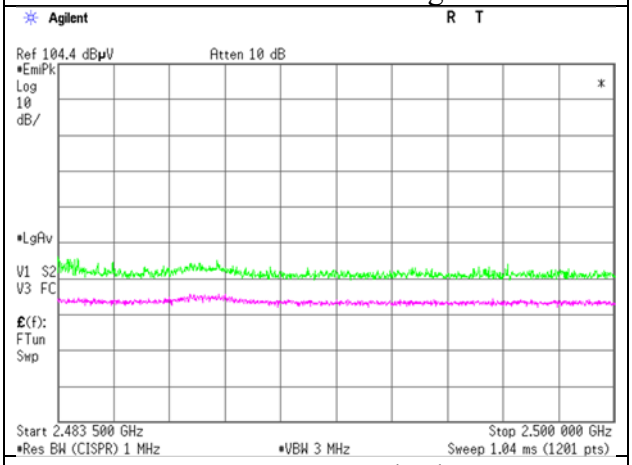
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 22, 2019
Temperature / Humidity	22 deg. C / 39 % RH
Engineer	Takahiro Suzuki
Mode	Tx BT LE 1 M-PHY 2480 MHz

Horizontal

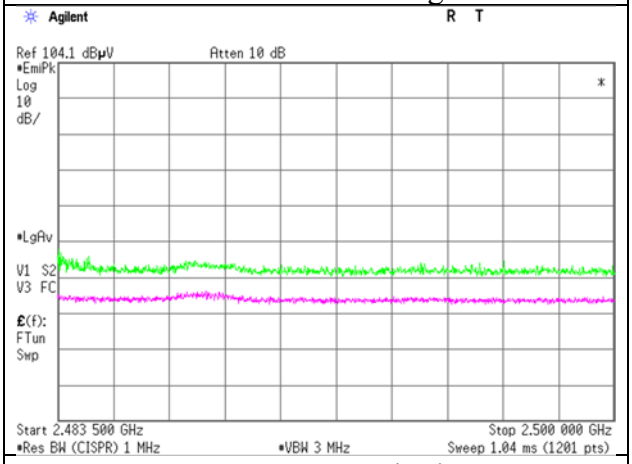
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	December 12, 2019	November 22, 2019	November 26, 2019	November 25, 2019
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 39 % RH	23 deg. C / 44 % RH	23 deg. C / 55 % RH
Engineer	Takahiro Suzuki	Takahiro Suzuki	Yasumasa Owaki	Yasumasa Owaki
	(30 MHz – 1000 MHz)	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2402 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	34.892	QP	23.61	16.61	6.57	32.19	0.00	14.60	40.0	25.4	251	354	
Hori.	36.706	QP	23.88	15.93	6.60	32.19	0.00	14.22	40.0	25.7	204	355	
Hori.	120.724	QP	23.86	12.98	7.29	32.14	0.00	11.99	43.5	31.5	176	4	
Hori.	2378.601	PK	53.72	28.36	14.09	41.59	2.35	56.93	73.9	16.9	145	83	
Hori.	2390.000	PK	47.92	28.33	14.10	41.59	2.35	51.11	73.9	22.7	140	86	
Hori.	4804.000	PK	47.89	31.62	6.44	42.88	2.35	45.42	73.9	28.4	150	0	Floor Noise
Hori.	7206.000	PK	48.78	37.23	7.87	42.92	2.35	53.31	73.9	20.5	150	0	Floor Noise
Hori.	9608.000	PK	49.66	38.84	9.16	43.17	2.35	56.84	73.9	17.0	150	0	Floor Noise
Hori.	4804.000	AV	39.38	31.62	6.44	42.88	2.35	36.91	53.9	16.9	150	0	Floor Noise
Hori.	7206.000	AV	39.75	37.23	7.87	42.92	2.35	44.28	53.9	9.6	150	0	Floor Noise
Hori.	9608.000	AV	40.14	38.84	9.16	43.17	2.35	47.32	53.9	**6.5**	150	0	Floor Noise
Vert.	50.676	QP	23.36	10.83	6.81	32.19	0.00	8.81	40.0	31.1	100	5	
Vert.	52.811	QP	25.00	10.10	6.78	32.19	0.00	9.69	40.0	30.3	100	97	
Vert.	71.181	QP	25.57	6.30	6.89	32.17	0.00	6.59	40.0	33.4	100	199	
Vert.	82.386	QP	27.48	6.61	7.61	32.16	0.00	9.54	40.0	30.4	100	2	
Vert.	719.672	QP	26.54	19.74	10.44	31.83	0.00	24.89	46.0	21.1	100	356	
Vert.	2378.546	PK	54.11	28.36	14.09	41.59	2.35	57.32	73.9	16.5	240	174	
Vert.	2390.000	PK	47.20	28.33	14.10	41.59	2.35	50.39	73.9	23.5	246	169	
Vert.	4804.000	PK	48.72	31.62	6.44	42.88	2.35	46.25	73.9	27.6	150	0	Floor Noise
Vert.	7206.000	PK	49.35	37.23	7.87	42.92	2.35	53.88	73.9	20.0	150	0	Floor Noise
Vert.	9608.000	PK	49.14	38.84	9.16	43.17	2.35	56.32	73.9	17.5	150	0	Floor Noise
Vert.	4804.000	AV	39.17	31.62	6.44	42.88	2.35	36.70	53.9	17.2	150	0	Floor Noise
Vert.	7206.000	AV	39.65	37.23	7.87	42.92	2.35	44.18	53.9	9.7	150	0	Floor Noise
Vert.	9608.000	AV	40.19	38.84	9.16	43.17	2.35	47.37	53.9	**6.5**	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2378.601	AV	40.71	28.36	14.09	41.59	9.26	2.35	53.18	53.9	**0.7**	
Hori.	2390.000	AV	38.19	28.33	14.10	41.59	9.26	2.35	50.64	53.9	3.2	*1)
Vert.	2378.546	AV	40.55	28.36	14.09	41.59	9.26	2.35	53.02	53.9	0.8	
Vert.	2390.000	AV	37.96	28.33	14.10	41.59	9.26	2.35	50.41	53.9	3.5	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

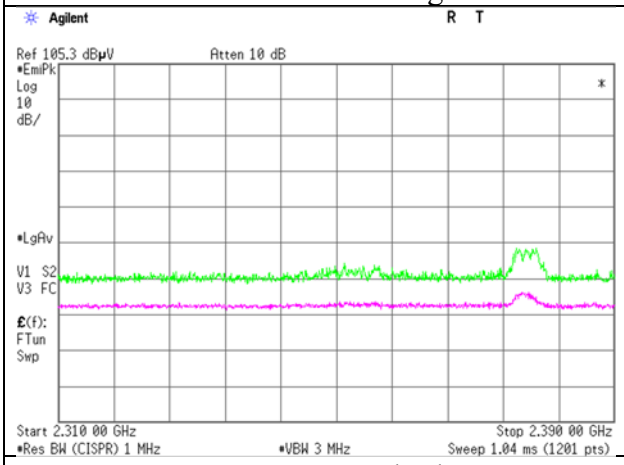
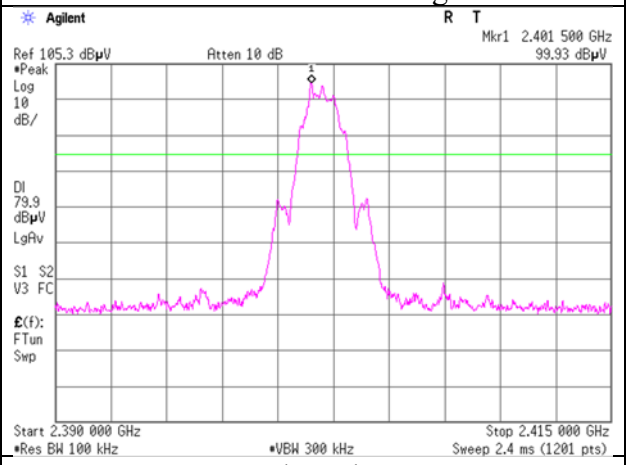
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	98.66	28.31	14.11	41.60	2.35	101.83	-	-	Carrier
Hori.	2400.000	PK	67.27	28.31	14.10	41.60	2.35	70.43	81.83	11.4	
Vert.	2402.000	PK	99.22	28.31	14.11	41.60	2.35	102.39	-	-	Carrier
Vert.	2400.000	PK	67.17	28.31	14.10	41.60	2.35	70.33	82.39	12.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

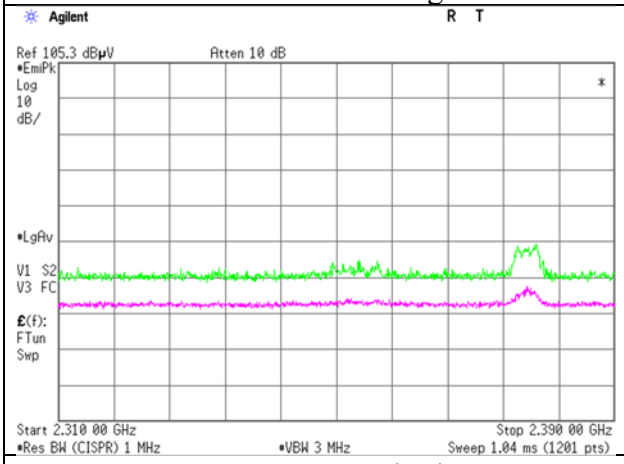
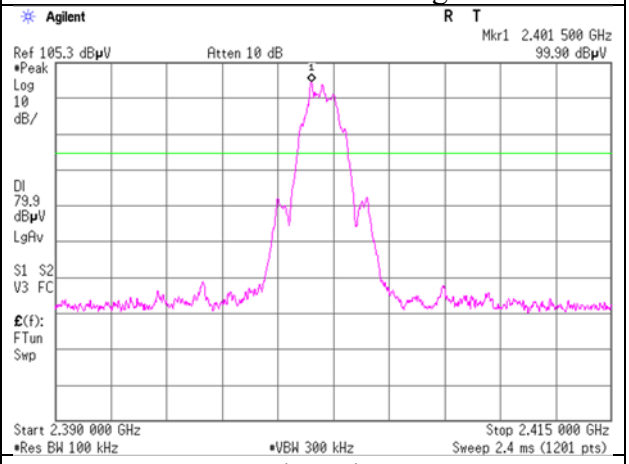
Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 22, 2019
Temperature / Humidity	22 deg. C / 39 % RH
Engineer	Takahiro Suzuki
Mode	Tx BT LE 2 M-PHY 2402 MHz

Horizontal

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical

Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	December 12, 2019	November 22, 2019	November 26, 2019	November 25, 2019
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 39 % RH	23 deg. C / 44 % RH	23 deg. C / 55 % RH
Engineer	Takahiro Suzuki	Takahiro Suzuki	Yasumasa Owaki	Yasumasa Owaki
	(30 MHz – 1000 MHz)	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2440 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	35.111	QP	23.64	16.52	6.57	32.19	0.00	14.54	40.0	25.4	203	283	
Hori.	36.796	QP	23.19	15.91	6.60	32.19	0.00	13.51	40.0	26.4	261	188	
Hori.	120.517	QP	23.85	12.97	7.29	32.14	0.00	11.97	43.5	31.5	122	55	
Hori.	4880.000	PK	48.36	31.71	6.49	42.89	2.35	46.02	73.9	27.8	150	0	Floor Noise
Hori.	7320.000	PK	48.88	37.38	7.95	43.15	2.35	53.41	73.9	20.4	150	0	Floor Noise
Hori.	9760.000	PK	48.21	39.33	9.21	43.01	2.35	56.09	73.9	17.8	150	0	Floor Noise
Hori.	4880.000	AV	39.28	31.71	6.49	42.89	2.35	36.94	53.9	16.9	150	0	Floor Noise
Hori.	7320.000	AV	39.45	37.38	7.95	43.15	2.35	43.98	53.9	9.9	150	0	Floor Noise
Hori.	9760.000	AV	39.02	39.33	9.21	43.01	2.35	46.90	53.9	**7.0**	150	0	Floor Noise
Vert.	50.568	QP	23.26	10.86	6.81	32.19	0.00	8.74	40.0	31.2	100	280	
Vert.	52.967	QP	25.01	10.05	6.78	32.19	0.00	9.65	40.0	30.3	100	345	
Vert.	71.514	QP	25.74	6.29	6.93	32.17	0.00	6.79	40.0	33.2	100	304	
Vert.	98.346	QP	27.99	9.76	7.42	32.15	0.00	13.02	43.5	30.4	100	358	
Vert.	719.788	QP	26.82	19.75	10.44	31.83	0.00	25.18	46.0	20.8	100	5	
Vert.	4880.000	PK	48.03	31.71	6.49	42.89	2.35	45.69	73.9	28.2	150	0	Floor Noise
Vert.	7320.000	PK	48.45	37.38	7.95	43.15	2.35	52.98	73.9	20.9	150	0	Floor Noise
Vert.	9760.000	PK	48.44	39.33	9.21	43.01	2.35	56.32	73.9	17.5	150	0	Floor Noise
Vert.	4880.000	AV	38.96	31.71	6.49	42.89	2.35	36.62	53.9	17.2	150	0	Floor Noise
Vert.	7320.000	AV	39.47	37.38	7.95	43.15	2.35	44.00	53.9	9.9	150	0	Floor Noise
Vert.	9760.000	AV	38.98	39.33	9.21	43.01	2.35	46.86	53.9	**7.0**	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	13024969S-AC-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	December 12, 2019	November 22, 2019	November 26, 2019	November 25, 2019
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 39 % RH	23 deg. C / 44 % RH	23 deg. C / 55 % RH
Engineer	Takahiro Suzuki	Takahiro Suzuki	Yasumasa Owaki	Yasumasa Owaki
	(30 MHz – 1000 MHz)	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2480 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	34.919	QP	23.18	16.60	6.57	32.19	0.00	14.16	40.0	25.8	218	133	
Hori.	36.891	QP	23.73	15.88	6.60	32.19	0.00	14.02	40.0	25.9	166	313	
Hori.	120.836	QP	23.38	12.99	7.30	32.14	0.00	11.53	43.5	31.9	205	354	
Hori.	2483.500	PK	49.24	28.24	14.18	41.62	2.35	52.39	73.9	21.5	152	65	
Hori.	2513.244	PK	53.28	28.21	14.20	41.63	2.35	56.41	73.9	17.4	148	69	
Hori.	4960.000	PK	48.33	31.96	6.54	42.91	2.35	46.27	73.9	27.6	150	0	Floor Noise
Hori.	7440.000	PK	47.96	37.56	8.04	43.38	2.35	52.53	73.9	21.3	150	0	Floor Noise
Hori.	9920.000	PK	48.17	39.18	9.27	42.84	2.35	56.13	73.9	17.7	150	0	Floor Noise
Hori.	4960.000	AV	39.21	31.96	6.54	42.91	2.35	37.15	53.9	16.7	150	0	Floor Noise
Hori.	7440.000	AV	39.23	37.56	8.04	43.38	2.35	43.80	53.9	10.1	150	0	Floor Noise
Hori.	9920.000	AV	38.09	39.18	9.27	42.84	2.35	46.05	53.9	**7.8**	150	0	Floor Noise
Vert.	50.641	QP	23.59	10.84	6.81	32.19	0.00	9.05	40.0	30.9	100	8	
Vert.	52.650	QP	24.91	10.16	6.79	32.19	0.00	9.67	40.0	30.3	100	19	
Vert.	71.143	QP	25.48	6.30	6.89	32.17	0.00	6.50	40.0	33.5	100	204	
Vert.	98.759	QP	27.73	9.85	7.42	32.15	0.00	12.85	43.5	30.6	100	359	
Vert.	721.402	QP	26.37	19.77	10.44	31.83	0.00	24.75	46.0	21.2	100	356	
Vert.	2483.500	PK	49.78	28.24	14.18	41.62	2.35	52.93	73.9	20.9	222	172	
Vert.	2513.409	PK	54.12	28.21	14.20	41.63	2.35	57.25	73.9	16.6	244	181	
Vert.	4960.000	PK	48.01	31.96	6.54	42.91	2.35	45.95	73.9	27.9	150	0	Floor Noise
Vert.	7440.000	PK	48.04	37.56	8.04	43.38	2.35	52.61	73.9	21.2	150	0	Floor Noise
Vert.	9920.000	PK	47.14	39.18	9.27	42.84	2.35	55.10	73.9	18.8	150	0	Floor Noise
Vert.	4960.000	AV	39.07	31.96	6.54	42.91	2.35	37.01	53.9	16.8	150	0	Floor Noise
Vert.	7440.000	AV	39.24	37.56	8.04	43.38	2.35	43.81	53.9	10.0	150	0	Floor Noise
Vert.	9920.000	AV	37.96	39.18	9.27	42.84	2.35	45.92	53.9	7.9	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	40.33	28.24	14.18	41.62	9.26	2.35	52.74	53.9	**1.1**	*1)
Hori.	2513.244	AV	39.42	28.21	14.20	41.63	9.26	2.35	51.81	53.9	2.0	
Vert.	2483.500	AV	40.03	28.24	14.18	41.62	9.26	2.35	52.44	53.9	1.4	*1)
Vert.	2513.409	AV	39.90	28.21	14.20	41.63	9.26	2.35	52.29	53.9	1.6	

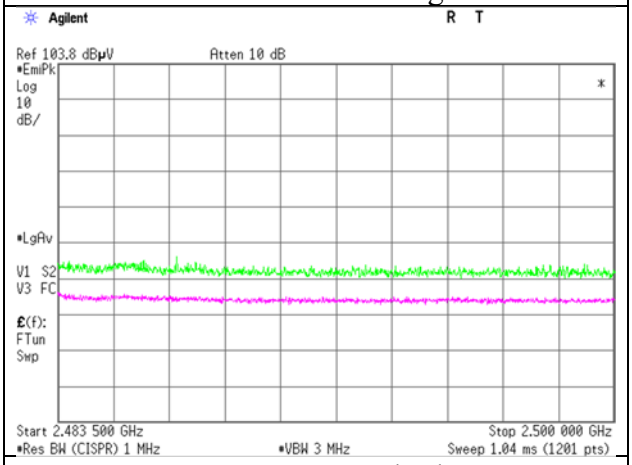
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	November 22, 2019
Temperature / Humidity	22 deg. C / 39 % RH
Engineer	Takahiro Suzuki
Mode	Tx BT LE 2 M-PHY 2480 MHz

Horizontal

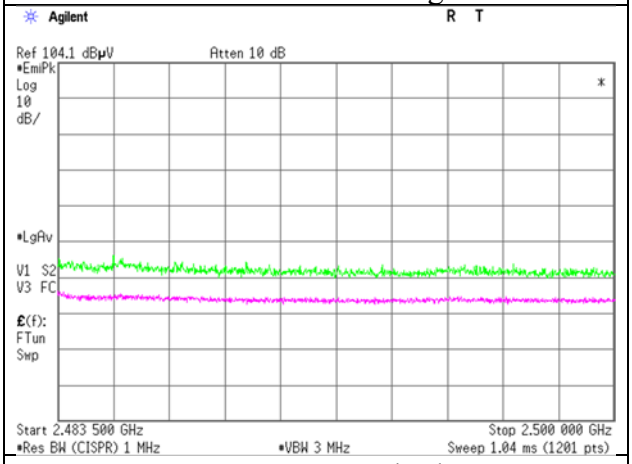
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

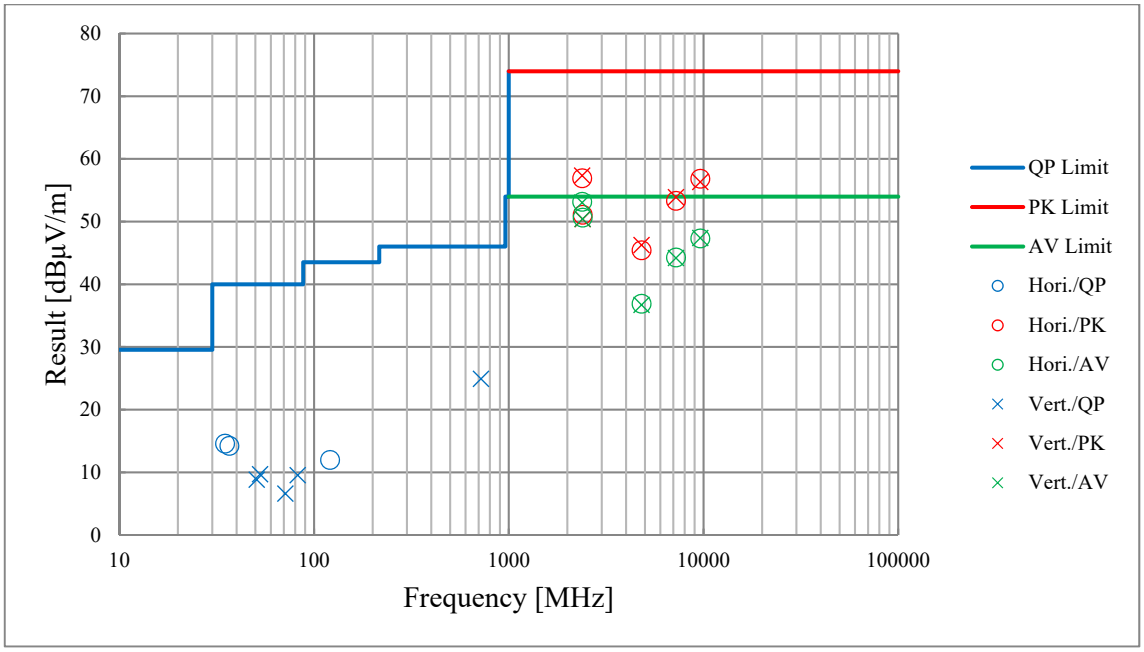


Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13024969S-AC-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	December 12, 2019	November 22, 2019	November 26, 2019	November 25, 2019
Temperature / Humidity	22 deg. C / 42 % RH	22 deg. C / 39 % RH	23 deg. C / 44 % RH	23 deg. C / 55 % RH
Engineer	Takahiro Suzuki	Takahiro Suzuki	Yasumasa Owaki	Yasumasa Owaki
	(30 MHz – 1000 MHz)	(1 GHz – 2.8 GHz)	(2.8 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2402 MHz			



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 9, 2020
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Kazuya Noda
	(1 GHz – 2.8 GHz)
Mode	Tx BT LE 1 M-PHY 2402 MHz with 11ac-40 Tx 5190 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2336.952	PK	52.83	28.44	14.05	41.57	2.35	56.10	73.9	**17.8**	155	84	
Hori.	2390.000	PK	47.38	28.33	14.10	41.59	2.35	50.57	73.9	23.3	192	84	
Vert.	2336.697	PK	52.02	28.44	14.05	41.57	2.35	55.29	73.9	18.6	217	172	
Vert.	2390.000	PK	46.98	28.33	14.10	41.59	2.35	50.17	73.9	23.7	129	165	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2336.952	AV	39.89	28.44	14.05	41.57	3.92	2.35	47.08	53.9	6.8	
Hori.	2390.000	AV	38.00	28.33	14.10	41.59	3.92	2.35	45.11	53.9	8.7	*1)
Vert.	2336.697	AV	41.92	28.44	14.05	41.57	3.92	2.35	49.11	53.9	**4.7**	
Vert.	2390.000	AV	38.17	28.33	14.10	41.59	3.92	2.35	45.28	53.9	8.6	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB

Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

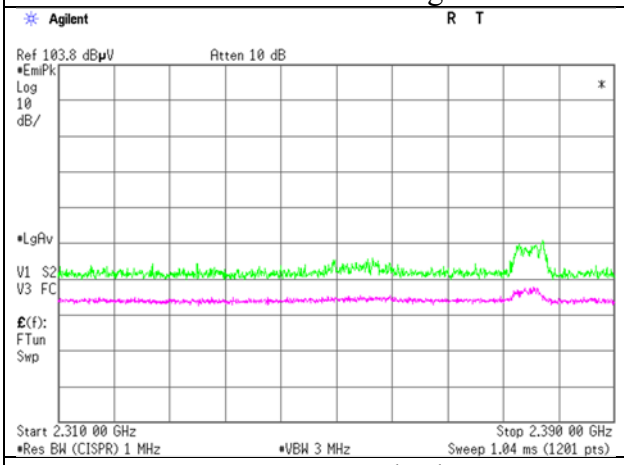
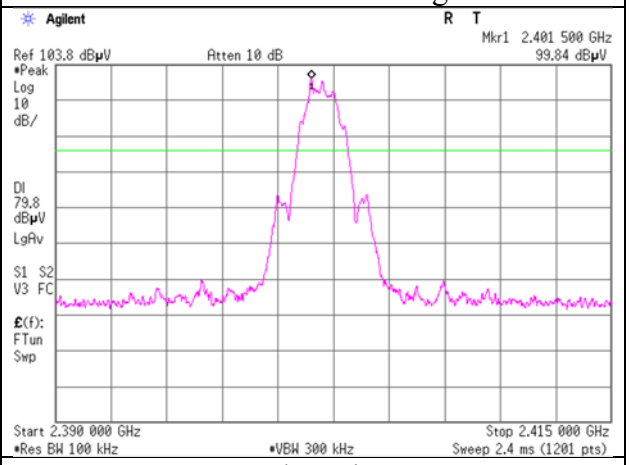
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

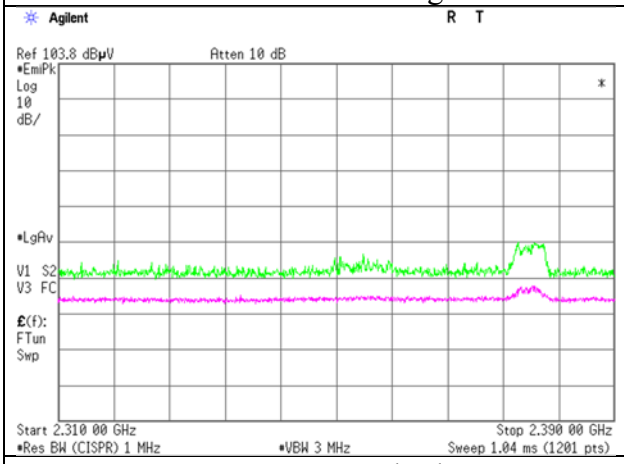
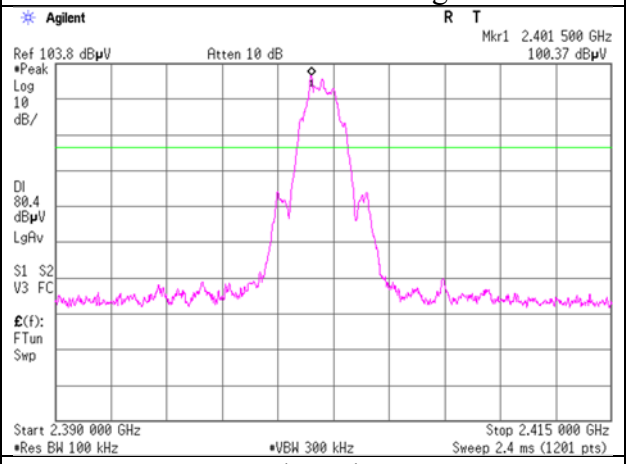
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	98.60	28.31	14.11	41.60	2.35	101.77	-	-	
Hori.	2400.000	PK	43.00	28.31	14.10	41.60	2.35	46.16	81.77	35.6	
Vert.	2402.000	PK	98.09	28.31	14.11	41.60	2.35	101.26	-	-	
Vert.	2400.000	PK	41.33	28.31	14.10	41.60	2.35	44.49	81.26	36.7	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 9, 2020
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Kazuya Noda
	(1 GHz – 2.8 GHz)
Mode	Tx BT LE 1 M-PHY 2402 MHz with 11ac-40 Tx 5190 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 9, 2020
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Kazuya Noda
	(1 GHz – 2.8 GHz)
Mode	Tx BT LE 1 M-PHY 2480 MHz with 11ac-40 Tx 5190 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	51.57	28.24	14.18	41.62	2.35	54.72	73.9	**19.1**	159	91	
Hori.	2487.805	PK	49.66	28.23	14.18	41.63	2.35	52.79	73.9	21.1	159	91	
Vert.	2483.500	PK	50.29	28.24	14.18	41.62	2.35	53.44	73.9	20.4	218	181	
Vert.	2487.590	PK	48.58	28.23	14.18	41.63	2.35	51.71	73.9	22.1	218	181	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.81	28.24	14.18	41.62	3.92	2.35	45.88	53.9	8.0	*1)
Hori.	2487.805	AV	39.43	28.23	14.18	41.63	3.92	2.35	46.48	53.9	**7.4**	
Vert.	2483.500	AV	38.81	28.24	14.18	41.62	3.92	2.35	45.88	53.9	8.0	*1)
Vert.	2487.590	AV	39.20	28.23	14.18	41.63	3.92	2.35	46.25	53.9	7.6	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB

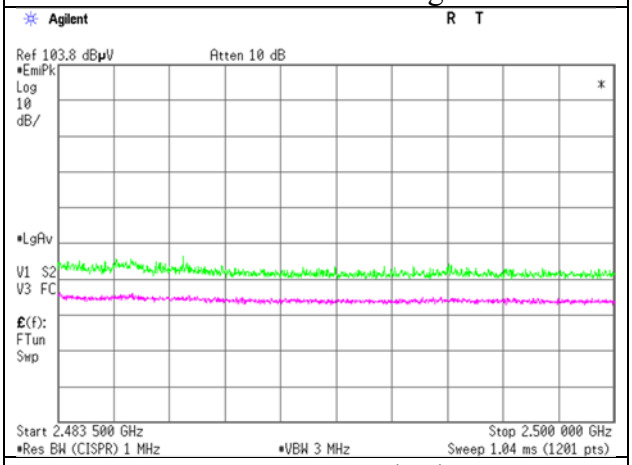
Duty factor refer to "Duty factor Calculation chart" sheet.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 9, 2020
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Kazuya Noda
	(1 GHz – 2.8 GHz)
Mode	Tx BT LE 1 M-PHY 2480 MHz with 11ac-40 Tx 5190 MHz

Horizontal

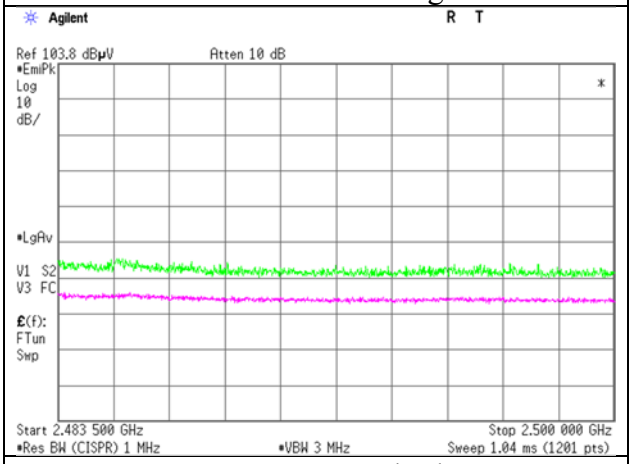
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	January 16, 2020	January 9, 2020	January 14, 2020	January 16, 2020
Temperature / Humidity	23 deg. C / 45 % RH	21 deg. C / 32 % RH	22 deg. C / 32 % RH	23 deg. C / 45 % RH
Engineer	Takahiro Kawakami	Kazuya Noda	Takahiro Kawakami	Takahiro Kawakami
	(30 MHz – 1000 MHz)	(1 GHz – 2.8 GHz)	(2.8 GHz - 18 GHz)	(18 GHz – 26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2402 MHz with 11ac-40 Tx 5190 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	41.986	QP	22.20	14.04	6.70	32.19	0.00	10.75	40.0	29.2	100	354	
Hori.	148.159	QP	22.35	14.60	7.80	32.12	0.00	12.63	43.5	30.8	100	356	
Hori.	339.602	QP	21.78	14.54	9.01	31.96	0.00	13.37	46.0	32.6	100	6	
Hori.	647.801	QP	21.69	18.99	10.17	31.96	0.00	18.89	46.0	27.1	150	330	
Hori.	2378.505	PK	55.18	28.36	14.09	41.59	2.35	58.39	73.9	15.5	155	83	
Hori.	2390.000	PK	49.12	28.33	14.10	41.59	2.35	52.31	73.9	21.5	184	83	
Hori.	4804.000	PK	50.55	31.62	6.41	42.88	2.35	48.05	73.9	25.8	225	47	
Hori.	7206.000	PK	47.79	37.23	7.85	42.92	2.35	52.30	73.9	21.6	150	0	Floor Noise
Hori.	9608.000	PK	47.84	38.84	9.01	43.17	2.35	54.87	73.9	19.0	150	0	Floor Noise
Hori.	7206.000	AV	38.94	37.23	7.85	42.92	2.35	43.45	53.9	10.4	150	0	Floor Noise
Hori.	9608.000	AV	38.48	38.84	9.01	43.17	2.35	45.51	53.9	**8.3**	150	0	Floor Noise
Vert.	91.753	QP	24.76	8.44	7.54	32.16	0.00	8.58	43.5	34.9	100	161	
Vert.	173.107	QP	21.90	15.61	7.90	32.10	0.00	13.31	43.5	30.1	100	294	
Vert.	363.800	QP	22.14	14.88	9.12	31.95	0.00	14.19	46.0	31.8	100	29	
Vert.	591.594	QP	21.91	18.77	9.96	31.94	0.00	18.70	46.0	27.3	100	358	
Vert.	2378.509	PK	54.96	28.36	14.09	41.59	2.35	58.17	73.9	15.7	235	189	
Vert.	2390.000	PK	48.03	28.33	14.10	41.59	2.35	51.22	73.9	22.6	249	182	
Vert.	4804.000	PK	48.14	31.62	6.41	42.88	2.35	45.64	73.9	28.2	150	0	
Vert.	7206.000	PK	47.99	37.23	7.85	42.92	2.35	52.50	73.9	21.4	150	0	Floor Noise
Vert.	9608.000	PK	47.65	38.84	9.01	43.17	2.35	54.68	73.9	19.2	150	0	Floor Noise
Vert.	7206.000	AV	38.80	37.23	7.85	42.92	2.35	43.31	53.9	10.5	150	0	Floor Noise
Vert.	9608.000	AV	38.33	38.84	9.01	43.17	2.35	45.36	53.9	8.5	150	0	Floor Noise

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2378.505	AV	40.89	28.36	14.09	41.59	9.26	2.35	53.36	53.9	**0.5**	
Hori.	2390.000	AV	38.00	28.33	14.10	41.59	9.26	2.35	50.45	53.9	3.4	*1)
Hori.	4804.000	AV	39.86	31.62	6.41	42.88	9.26	2.35	46.62	53.9	7.2	
Vert.	2378.509	AV	40.74	28.36	14.09	41.59	9.26	2.35	53.21	53.9	0.6	
Vert.	2390.000	AV	38.32	28.33	14.10	41.59	9.26	2.35	50.77	53.9	3.1	*1)
Vert.	4804.000	AV	38.70	31.62	6.41	42.88	9.26	2.35	45.46	53.9	8.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB

Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

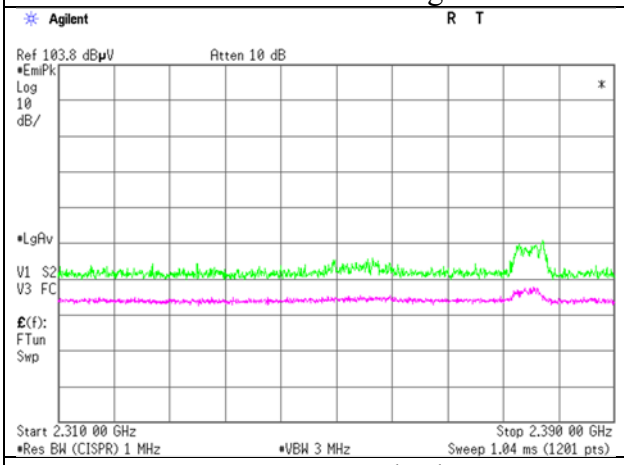
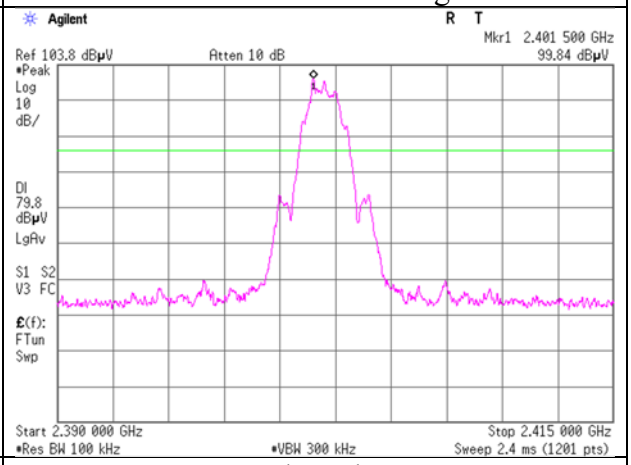
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

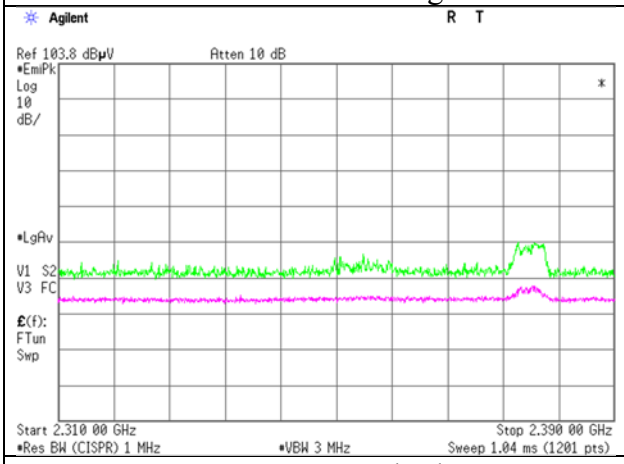
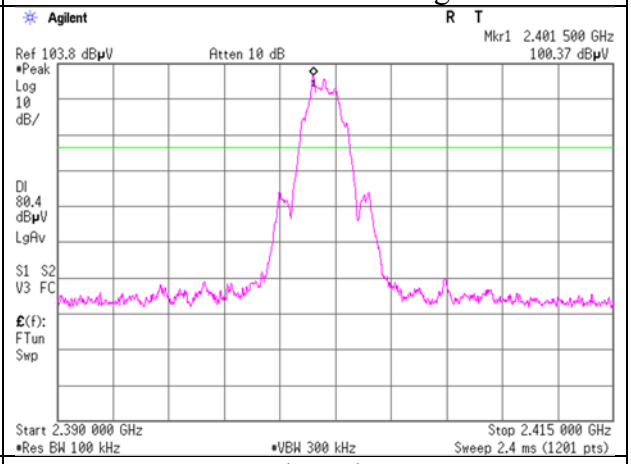
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	99.52	28.31	14.11	41.60	2.35	102.69	-	-	
Hori.	2400.000	PK	66.79	28.31	14.10	41.60	2.35	69.95	82.69	12.7	
Vert.	2402.000	PK	99.99	28.31	14.11	41.60	2.35	103.16	-	-	
Vert.	2400.000	PK	67.49	28.31	14.10	41.60	2.35	70.65	83.16	12.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 9, 2020
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Kazuya Noda
	(1 GHz – 2.8 GHz)
Mode	Tx BT LE 2 M-PHY 2402 MHz with 11ac-40 Tx 5190 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 9, 2020
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Kazuya Noda
	(1 GHz – 2.8 GHz)
Mode	Tx BT LE 2 M-PHY 2480 MHz with 11ac-40 Tx 5190 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.44	28.24	14.18	41.62	2.35	52.59	73.9	21.3	161	88	
Hori.	2513.354	PK	54.43	28.21	14.20	41.63	2.35	57.56	73.9	16.3	156	89	
Vert.	2483.500	PK	50.93	28.24	14.18	41.62	2.35	54.08	73.9	19.8	232	181	
Vert.	2512.975	PK	55.58	28.21	14.20	41.63	2.35	58.71	73.9	**15.1**	222	182	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	38.55	28.24	14.18	41.62	9.26	2.35	50.96	53.9	2.9	*1)
Hori.	2513.354	AV	39.66	28.21	14.20	41.63	9.26	2.35	52.05	53.9	1.8	
Vert.	2483.500	AV	39.01	28.24	14.18	41.62	9.26	2.35	51.42	53.9	2.4	*1)
Vert.	2512.975	AV	40.17	28.21	14.20	41.63	9.26	2.35	52.56	53.9	**1.3**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.93 m / 3.0 m) = 2.35 dB

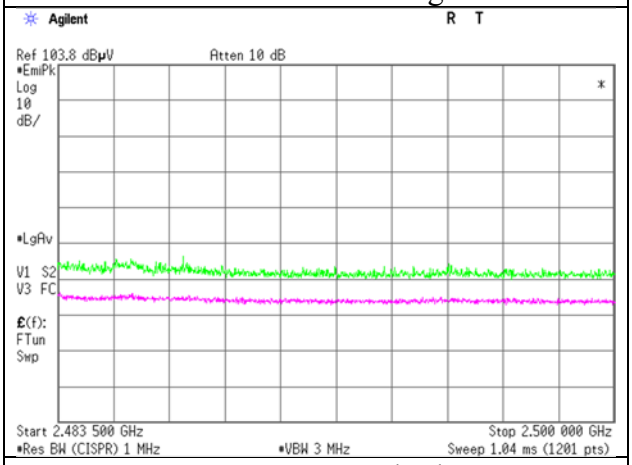
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	No.3
Date	January 9, 2020
Temperature / Humidity	21 deg. C / 32 % RH
Engineer	Kazuya Noda
	(1 GHz – 2.8 GHz)
Mode	Tx BT LE 2 M-PHY 2480 MHz with 11ac-40 Tx 5190 MHz

Horizontal

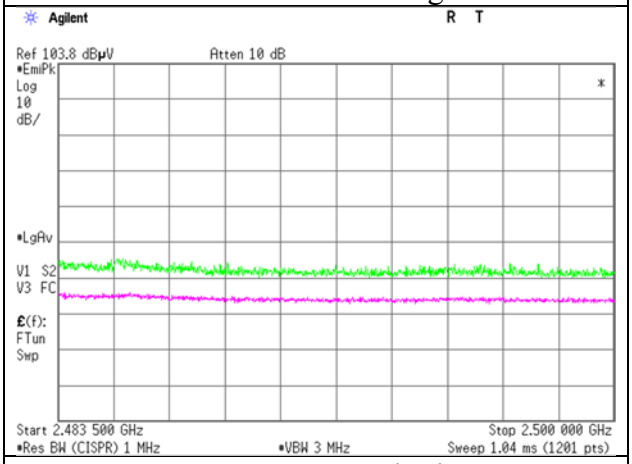
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

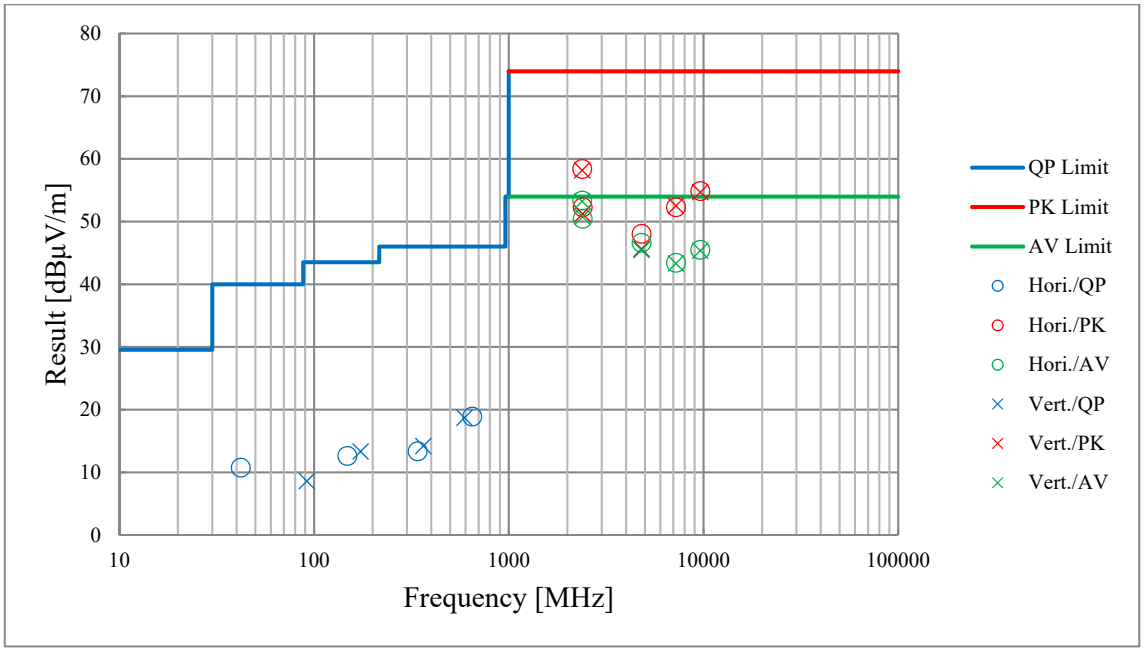


Trace Green : Peak Plot
Trace Purple : Average Plot

* The measurement was conducted for a sufficiently long enough time to detect any possible spurious emissions.
Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	13024969S-AC-R3			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	No.3	No.3	No.3	No.3
Date	January 16, 2020	January 9, 2020	January 14, 2020	January 16, 2020
Temperature / Humidity	23 deg. C / 45 % RH	21 deg. C / 32 % RH	22 deg. C / 32 % RH	23 deg. C / 45 % RH
Engineer	Takahiro Kawakami	Kazuya Noda	Takahiro Kawakami	Takahiro Kawakami
	(30 MHz – 1000 MHz)	(1 GHz – 2.8 GHz)	(2.8 GHz - 18 GHz)	(18 GHz – 26.5 GHz)
Mode	Tx BT LE 2 M-PHY 2402 MHz with 11ac-40 Tx 5190 MHz			

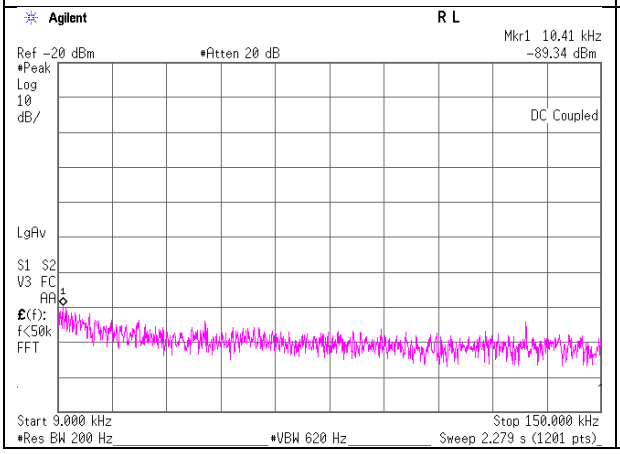


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

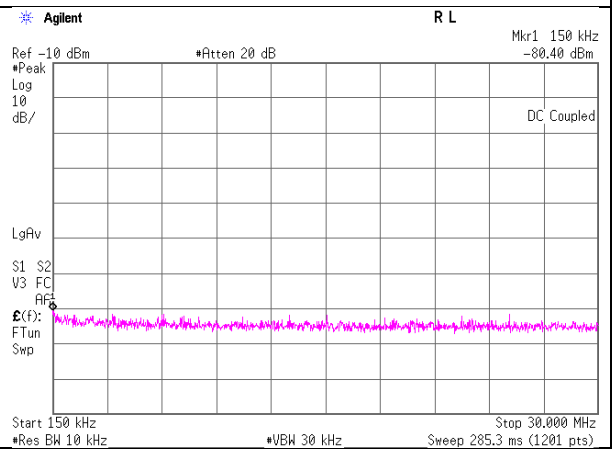
Conducted Spurious Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx 11g 2412 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
10.41	-89.3	0.02	9.8	3.0	1	-76.5	300	6.0	-15.3	47.2	62.5	-
150.00	-80.4	0.02	9.8	3.0	1	-67.6	300	6.0	-6.3	24.0	30.3	-

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

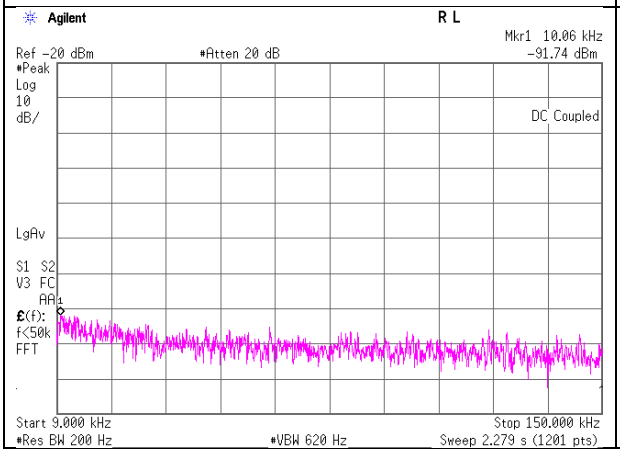
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

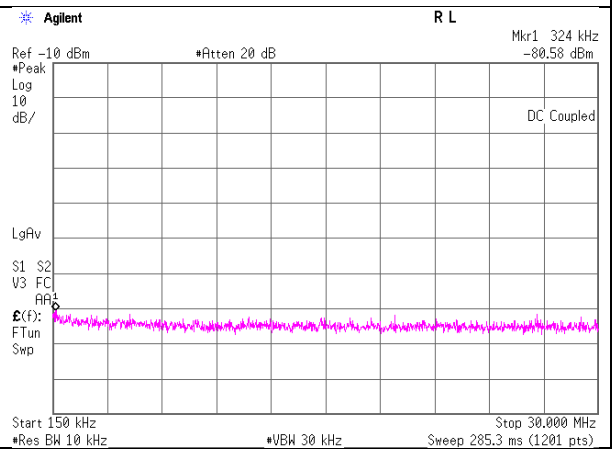
Conducted Spurious Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx BT LE 1 M-PHY 2402 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
10.06	-91.7	0.02	9.8	3.0	1	-78.9	300	6.0	-17.7	47.5	65.2	-
324.00	-80.6	0.02	9.8	3.0	1	-67.8	300	6.0	-6.5	17.3	23.8	-

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

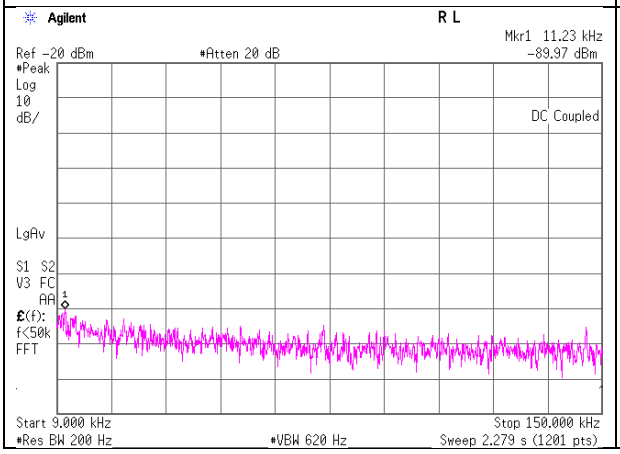
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

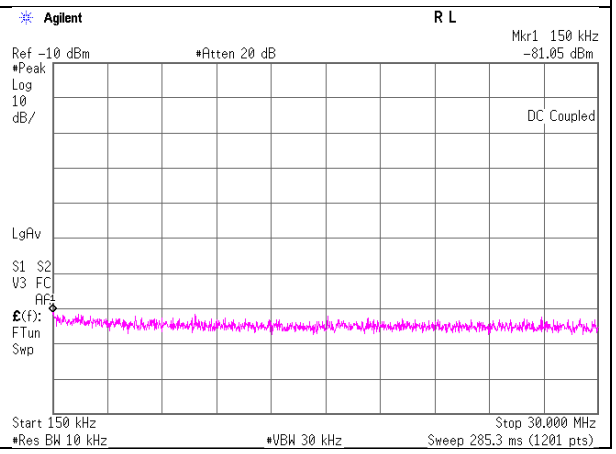
Conducted Spurious Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx BT LE 1 M-PHY 2440 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.23	-90.0	0.02	9.8	3.0	1	-77.2	300	6.0	-15.9	46.5	62.4	-
150.00	-81.1	0.02	9.8	3.0	1	-68.2	300	6.0	-7.0	24.0	31.0	-

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

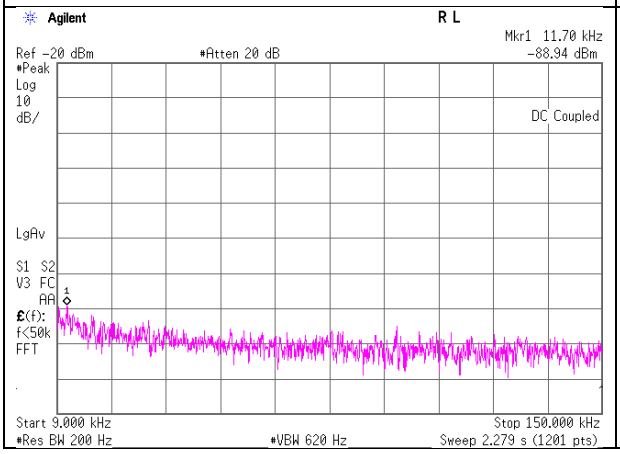
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

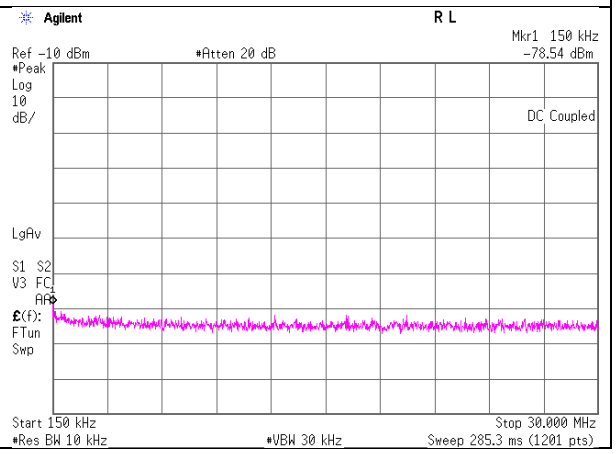
Conducted Spurious Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx BT LE 1 M-PHY 2480 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.70	-88.9	0.02	9.8	3.0	1	-76.1	300	6.0	-14.9	46.2	61.1	-
150.00	-78.5	0.02	9.8	3.0	1	-65.7	300	6.0	-4.5	24.0	28.5	-

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

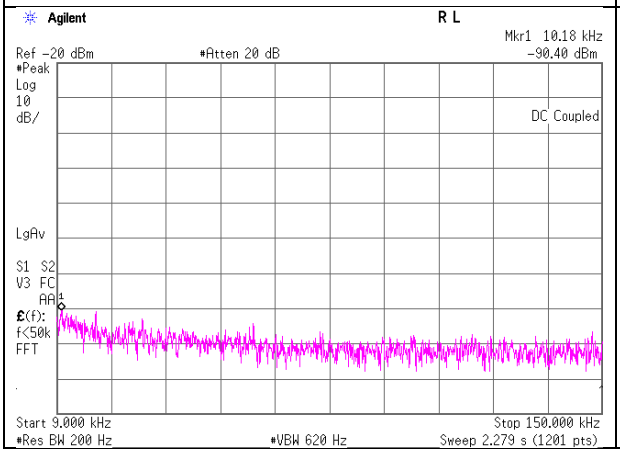
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

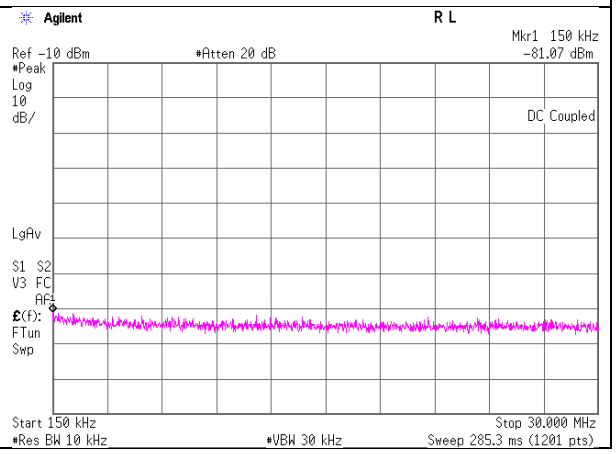
Conducted Spurious Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx BT LE 2 M-PHY 2402 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
10.18	-90.4	0.02	9.8	3.0	1	-77.6	300	6.0	-16.3	47.4	63.7	-
150.00	-81.1	0.02	9.8	3.0	1	-68.3	300	6.0	-7.0	24.0	31.0	-

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

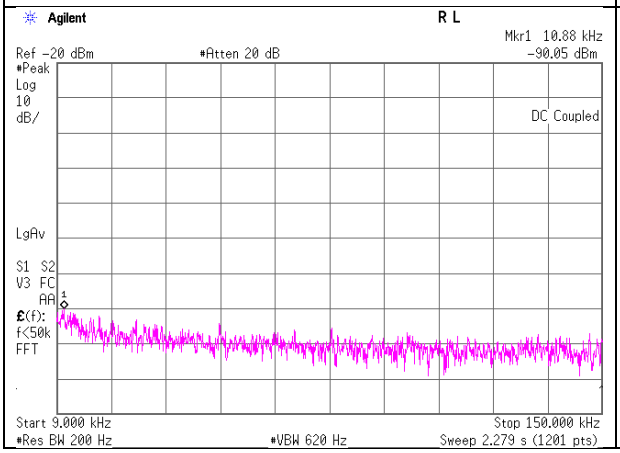
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

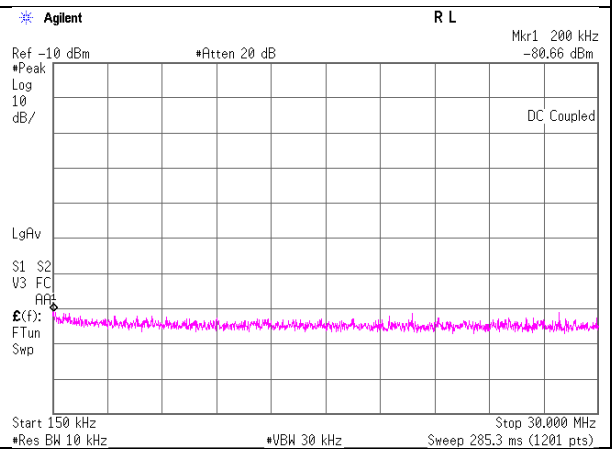
Conducted Spurious Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx BT LE 2 M-PHY 2440 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
10.88	-90.1	0.02	9.8	3.0	1	-77.3	300	6.0	-16.0	46.8	62.8	-
200.00	-80.7	0.02	9.8	3.0	1	-67.9	300	6.0	-6.6	21.5	28.1	-

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

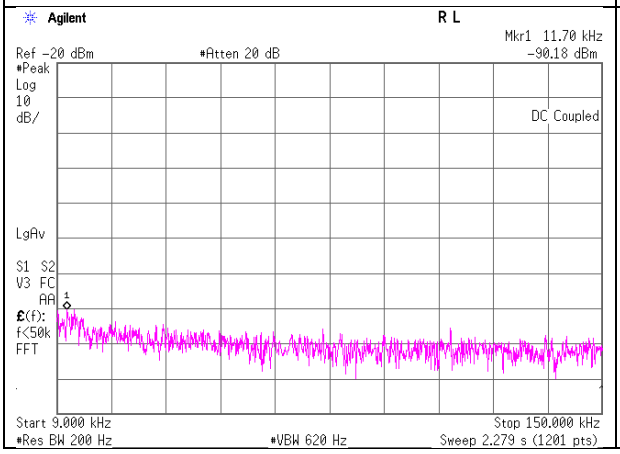
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

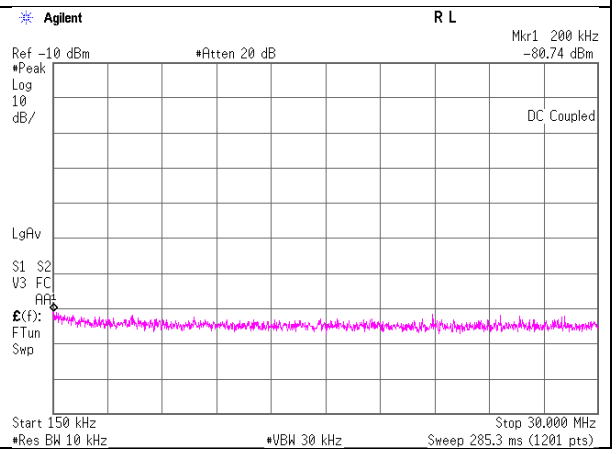
Conducted Spurious Emission

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.5 Shielded Room
Date	October 31, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Makoto Hosaka
Mode	Tx BT LE 2 M-PHY 2480 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.70	-90.2	0.02	9.8	3.0	1	-77.4	300	6.0	-16.1	46.2	62.3	-
200.00	-80.7	0.02	9.8	3.0	1	-67.9	300	6.0	-6.7	21.5	28.2	-

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

Power Density

Report No.	13024969S-AC-R3	
Test place	Shonan EMC Lab. No.1 Measurement Room	
Date	November 9, 2019	December 2, 2019
Temperature / Humidity	24 deg. C / 45 % RH	20 deg. C / 45 % RH
Engineer	Kazuya Noda	Takahiro Kawakami
Mode	Tx	

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-30.45	1.04	9.89	-19.52	8.00	27.52
2437	-30.42	1.04	9.89	-19.49	8.00	27.49
2462	-30.34	1.05	9.89	-19.40	8.00	27.40

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-25.74	1.82	9.89	-14.03	8.00	22.03
2437	-25.54	1.83	9.89	-13.82	8.00	21.82
2462	-25.54	1.84	9.89	-13.81	8.00	21.81

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412	-27.96	1.82	9.89	-16.25	8.00	24.25
2437	-27.78	1.83	9.89	-16.06	8.00	24.06
2462	-27.80	1.84	9.89	-16.07	8.00	24.07

11n-40

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2422	-32.33	1.82	9.89	-20.62	8.00	28.62
2437	-32.16	1.83	9.89	-20.44	8.00	28.44
2452	-32.12	1.83	9.89	-20.40	8.00	28.40

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

Power Density

Report No.	13024969S-AC-R3
Test place	Shonan EMC Lab. No.1 Measurement Room
Date	November 9, 2019
Temperature / Humidity	24 deg. C / 45 % RH
Engineer	Kazuya Noda
Mode	Tx

BT LE 1 M-PHY

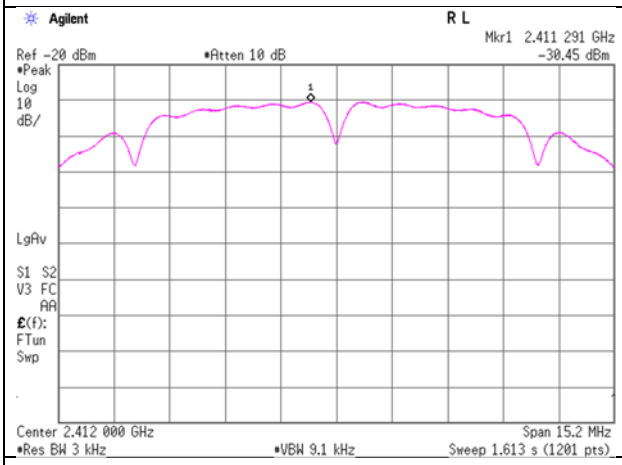
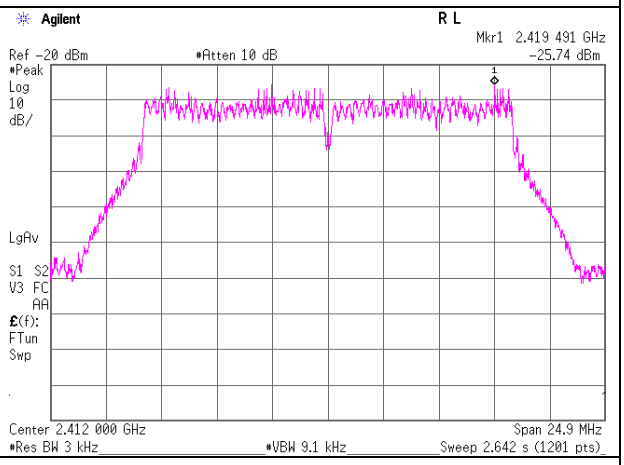
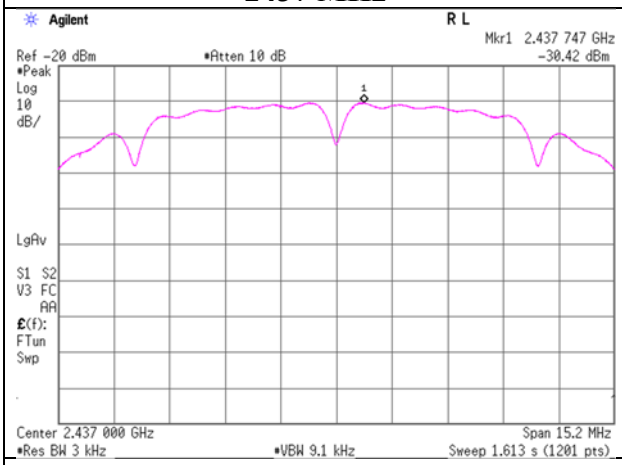
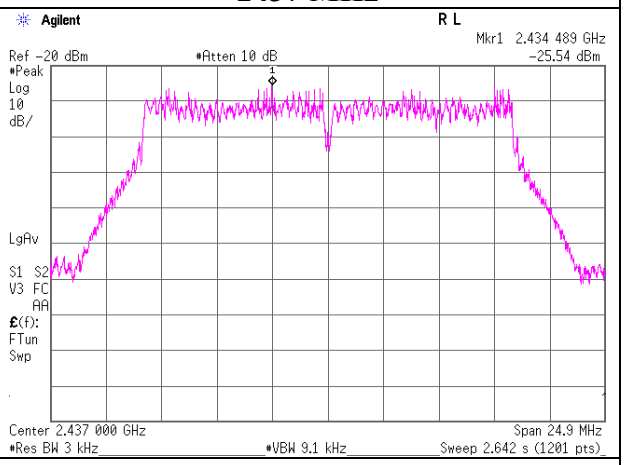
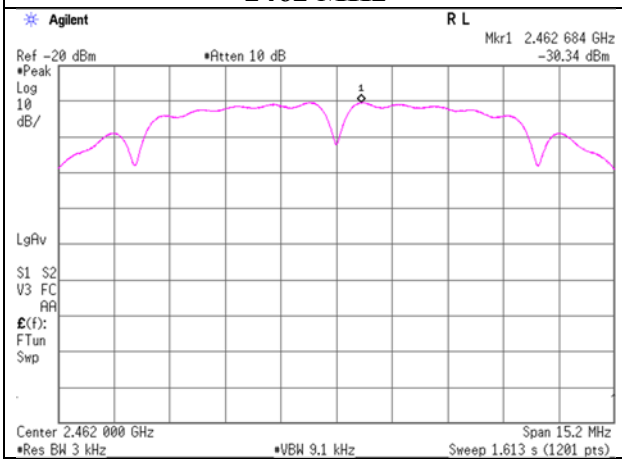
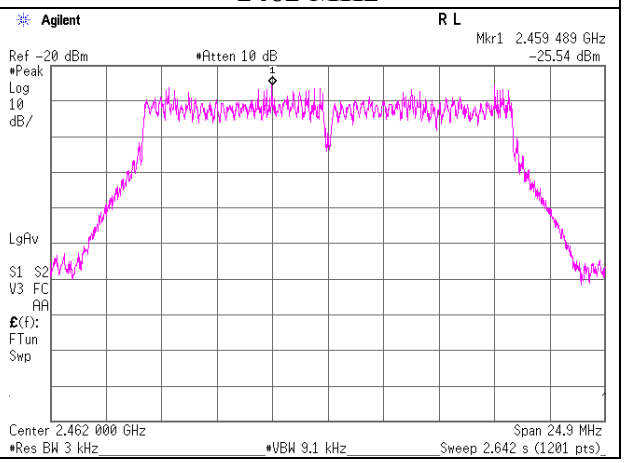
Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402	-20.73	1.81	9.89	-9.03	8.00	17.03
2440	-21.12	1.83	9.89	-9.40	8.00	17.40
2480	-22.00	1.84	9.89	-10.27	8.00	18.27

BT LE 2 M-PHY

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402	-24.32	1.81	9.89	-12.62	8.00	20.62
2440	-24.67	1.83	9.89	-12.95	8.00	20.95
2480	-25.44	1.84	9.89	-13.71	8.00	21.71

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

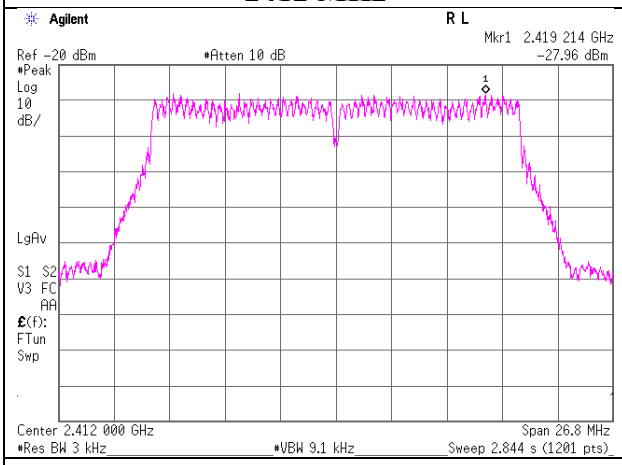
Power Density

11b	11g
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

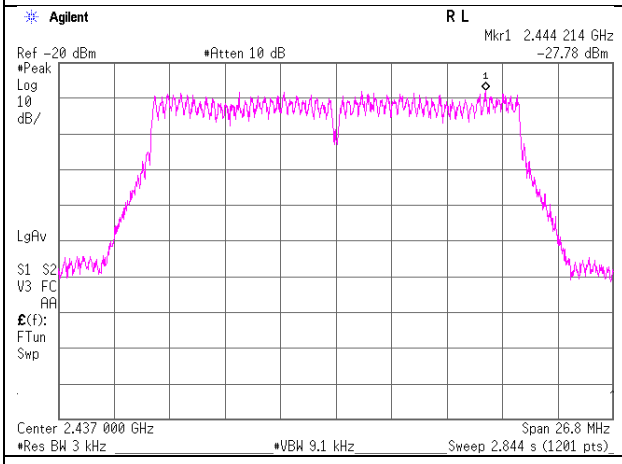
Power Density

11n-20

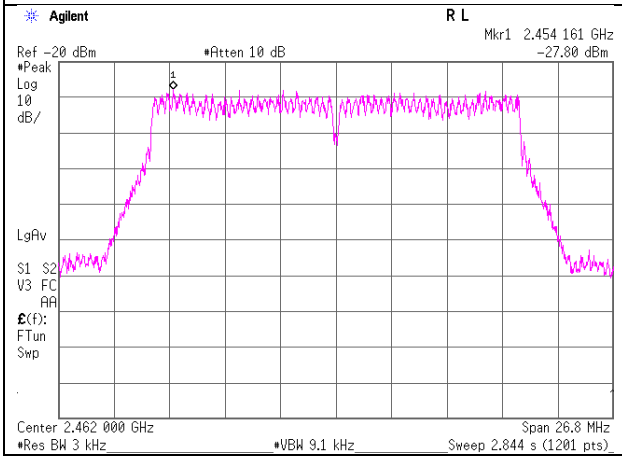
2412 MHz



2437 MHz

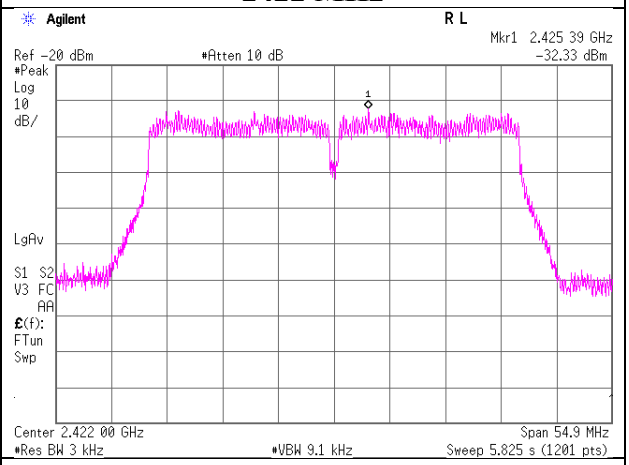


2462 MHz

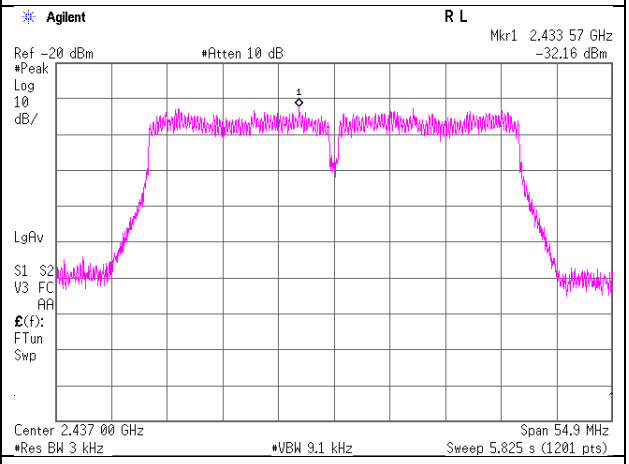


11n-40

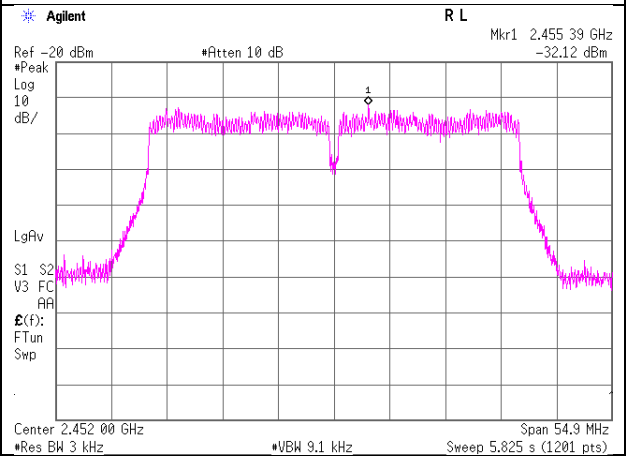
2422 MHz



2437 MHz



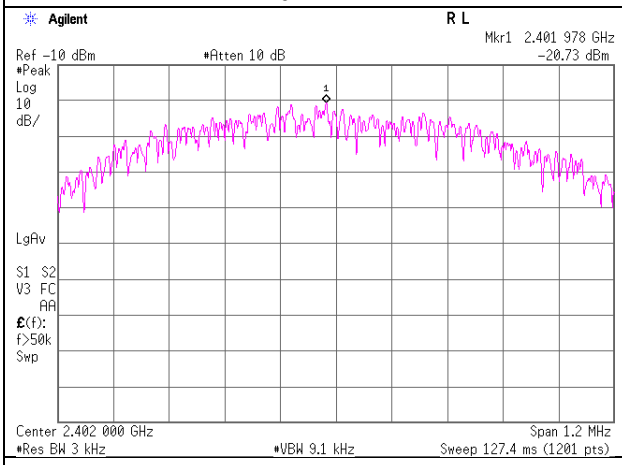
2452 MHz



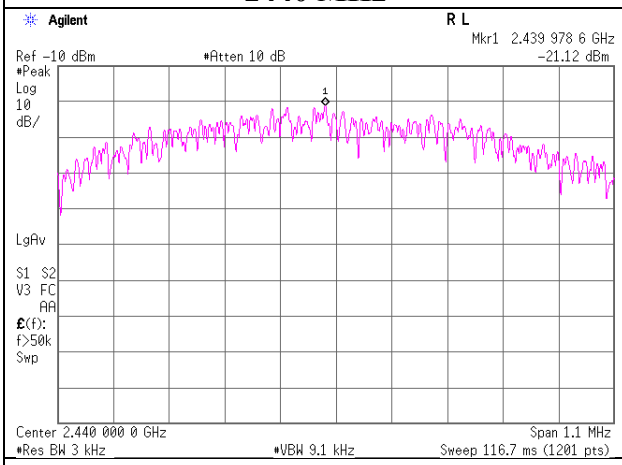
Power Density

BT LE 1 M-PHY

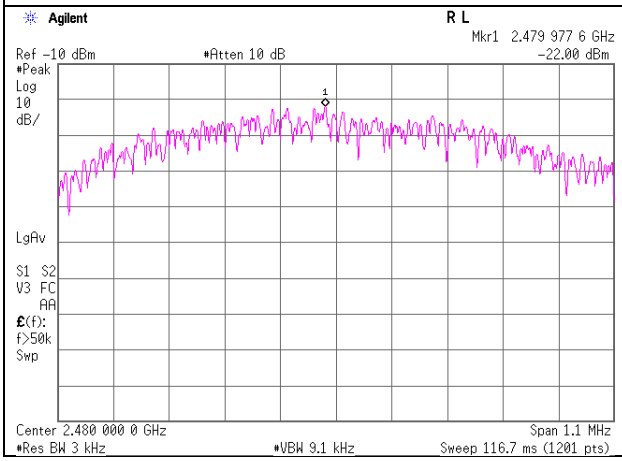
2402 MHz



2440 MHz

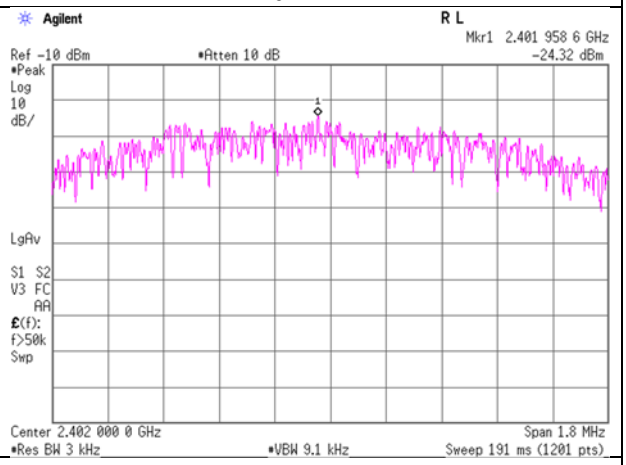


2480 MHz

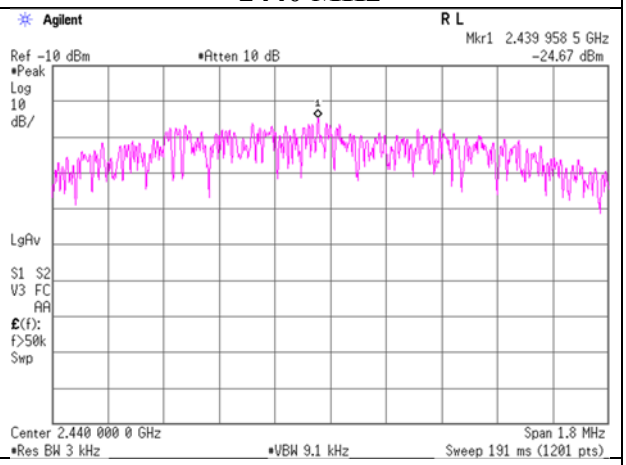


BT LE 2 M-PHY

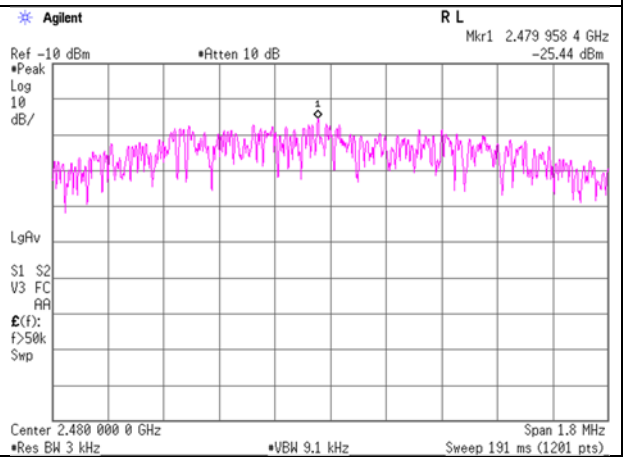
2402 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test instruments

Test equipment

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
AT	KSA-08	145089	Spectrum Analyzer	AGILENT	E4446A	MY46180525	2019/11/05	12
AT	KTS-07	145111	Digital Tester	SANWA	PC500	7019232	2019/10/01	12
AT	SAT10-16	160494	Attenuator	Weinschel Corp.	54A-10	83406	2019/12/12	12
AT	SCC-G32	145183	Coaxial Cable	Junkosha	MWX241-02000KMSKMS	OCT-09-13-005	-	-
AT	SOS-09	146318	Humidity Indicator	A&D	AD-5681	4061484	-	-
AT	SOS-13	146321	Humidity Indicator	CUSTOM	CTH-202	Q.C.17	2019/12/19	12
AT	SPM-07	146247	Power Meter	AGILENT	8990B	MY5100272	2019/07/16	12
AT	SPM-13	169910	Power Meter	Keysight Technologies Inc	8990B	MY51000448	2019/03/06	12
AT	SPSS-04	146310	Power sensor	AGILENT	N1923A	MY5326009	2019/07/16	12
AT	SPSS-06	169911	Power sensor	Keysight Technologies Inc	N1923A	MY57270004	2019/03/06	12
AT	STS-05	146212	Digital Hitester	HIOKI	3805-50	80997828	2019/10/01	12
AT,RE	SRENT-09	150461	Spectrum Analyzer	AGILENT (KEYSIGHT)	E4440A	MY46186392	2019/01/03	12
AT,RE	SRENT-15	160899	Spectrum Analyzer	AGILENT (KEYSIGHT)	E4440A	MY46185516	2019/01/21	12
CE	KTS-06	145110	Digital Tester	SANWA	PC500	7019240	2019/04/02	12
CE	SAT3-10	144960	Attenuator	JFW	50HF-003N	-	2019/08/06	12
CE	SCC-C6/C7/C8/C10/SRSE-03	145034	Coaxial Cable&RF Selector	Suhner/Fujikura/Suhner/Suhner/TOYO	141PE/12DSFA/141PE/141PE/NS4906	-/0901-271(RF Selector)	2019/04/19	12
CE	SLS-05	145542	LISN	Rohde & Schwarz	ENV216	100516	2019/02/19	12
CE	SOS-22	191839	Humidity Indicator	CUSTOM	CTH-201	-	2019/12/12	12
CE,RE	COTS-SEMI-5	170932	EMI Software	TSJ	TEPTO-DV3(RE,CE,ME,PE)	-	-	-
CE,RE	KJM-02	146432	Measure	TAJIMA	GL19-55	-	-	-
CE,RE	STR-08	150463	Test Receiver	Rohde & Schwarz	ESW44	101581	2019/11/22	12
RE	SAEC-02(SVSWR)	145598	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	2019/05/09	12
RE	SAEC-03(NSA)	145565	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	2019/04/08	12
RE	SAEC-03(SVSWR)	145566	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	2019/05/03	12
RE	SAF-03	145126	Pre Amplifier	SONOMA	310N	290213	2019/02/05	12
RE	SAF-05	145128	Pre Amplifier	Toyo Corporation	TPA0118-36	1440490	2019/07/12	12
RE	SAF-06	145005	Pre Amplifier	Toyo Corporation	TPA0118-36	1440491	2019/02/08	12
RE	SAF-08	145007	Pre Amplifier	Toyo Corporation	HAP18-26W	19	2019/03/05	12
RE	SAT10-05	145136	Attenuator(above1GHz)	AGILENT	8493C-010	74864	2019/11/06	12
RE	SAT10-06	145137	Attenuator	AGILENT	8493C-010	74865	2019/11/06	12
RE	SAT6-13	167094	Attenuator	JFW	50HF-006N	-	2019/02/05	12
RE	SBA-03	145023	Biconical Antenna	Schwarzbeck	BBA9106	91032666	2019/05/07	12
RE	SCC-C1/C2/C3/C4/C5/C10/SRSE-03	145171	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	2019/04/19	12
RE	SCC-G40	166491	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S005	2020/01/08	12

Test Item	Local ID	LIMS ID	Description	Manufacturer	Model	Serial	Last Calibration Date	Cal Int
RE	SCC-G41	151617	Coaxial Cable	Junkosha	MWX221-01000NFSNMS/B	1612S006	2020/01/08	12
RE	SCC-G43	156380	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	SN MY 13406/4E	2019/07/03	12
RE	SCC-G45	168301	Coaxial Cable	HUBER+SUNER	SUCOFLEX 102 E	800137/2EA	2019/03/26	12
RE	SCC-G50	178573	Coaxial Cable	HUBER+SUNER	SUCOFLEX_104_E	MY13407/4E	2019/03/26	12
RE	SCC-G51	178572	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800288 /4A	2019/03/26	12
RE	SCC-G57	179540	Coaxial Cable	Huber+Suhner	SUCOFLEX 102	802815/2	2019/05/16	12
RE	SCC-G58	183047	Coaxial Cable	HUBER+SUNER	SUCOFLEX 104	800287/4A	2019/07/23	12
RE	SFL-18	145305	Highpass Filter	MICRO-TRONICS	HPM50111	119	2019/04/16	12
RE	SHA-02	145384	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	2019/06/26	12
RE	SHA-03	145501	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	2019/06/26	12
RE	SHA-04	145512	Horn Antenna	ETS LINDGREN	3160-09	00094868	2019/06/26	12
RE	SJM-09	145336	Measure	PROMART	SEN1935	-	-	-
RE	SLA-07	145529	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	2019/05/07	12
RE	SOS-03	146317	Humidity Indicator	A&D	AD-5681	4063325	2019/10/08	12
RE	SOS-05	146293	Humidity Indicator	A&D	AD-5681	4062518	2019/10/08	12
RE	SSA-02	145800	Spectrum Analyzer	AGILENT	E4448A	MY48250106	2019/04/04	12
RE	STR-07	146209	Test Receiver	Rohde & Schwarz	ESU26	100484	2019/09/13	12
RE	STS-02	145793	Digital Hitester	HIOKI	3805-50	80997819	2019/04/02	12
RE	STS-03	146210	Digital Hitester	HIOKI	3805-50	80997823	2019/10/01	12

***Hyphens for Last Calibration Date and Cal Int (month) are instruments that Calibration is not required (e.g. software), or instruments checked in advance before use.**

The expiration date of the calibration is the end of the expired month.
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

Test item: **CE: Conducted Emission test**
RE: Radiated Emission test
AT: Antenna Terminal Conducted test